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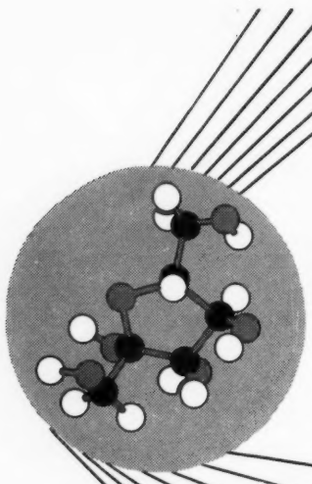

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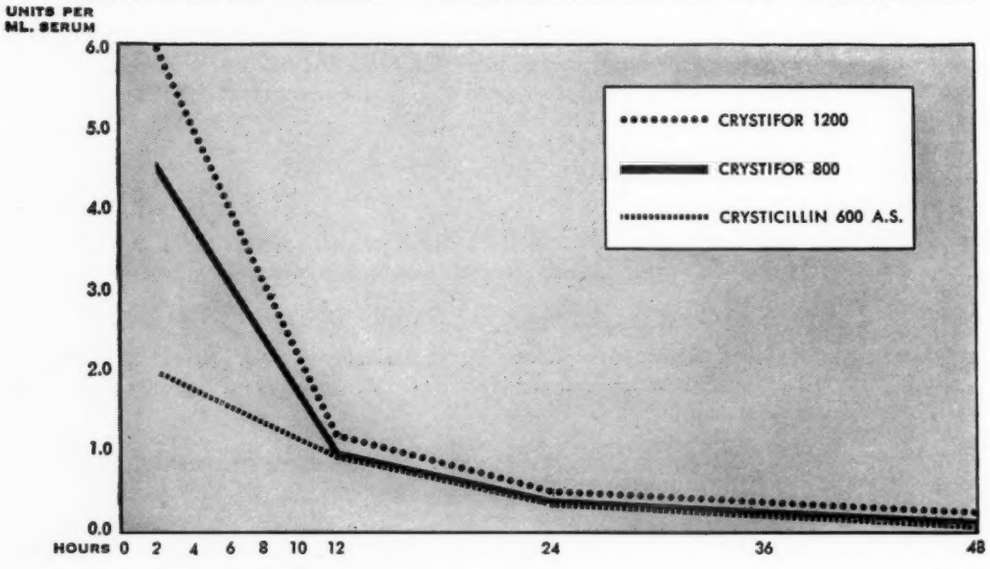

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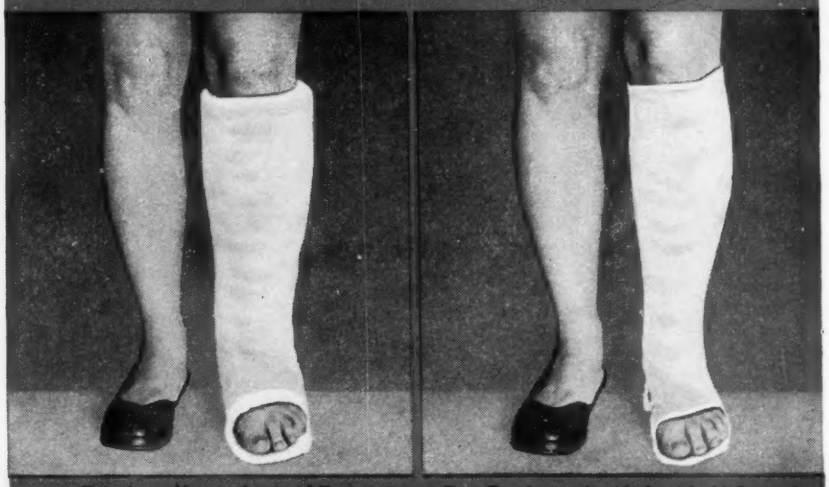

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1. A. W. Spittler, Col., (M.C.), U.S.A., J. J. Brennan, Lt. Col., (M.C.), U.S.A., J. W. Payne, Capt., U.S.A.F. (M.C.), American Academy of Orthopedic Surgeons, Jan. 26-31, 1952, Chicago, Illinois.
2. M. C. Cobey, M.D., F.A.C.S., Professor of Orthopedic Surgery, Georgetown University and Senior Attending Orthopedic Surgeon, Children's Hospital, Washington, D.C., The American Surgeon, Vol. XVIII, No. 4, April, 1952, pp. 413, 415.
3. M. C. Cobey, M.D., F.A.C.S., Washington, D.C., private communication.

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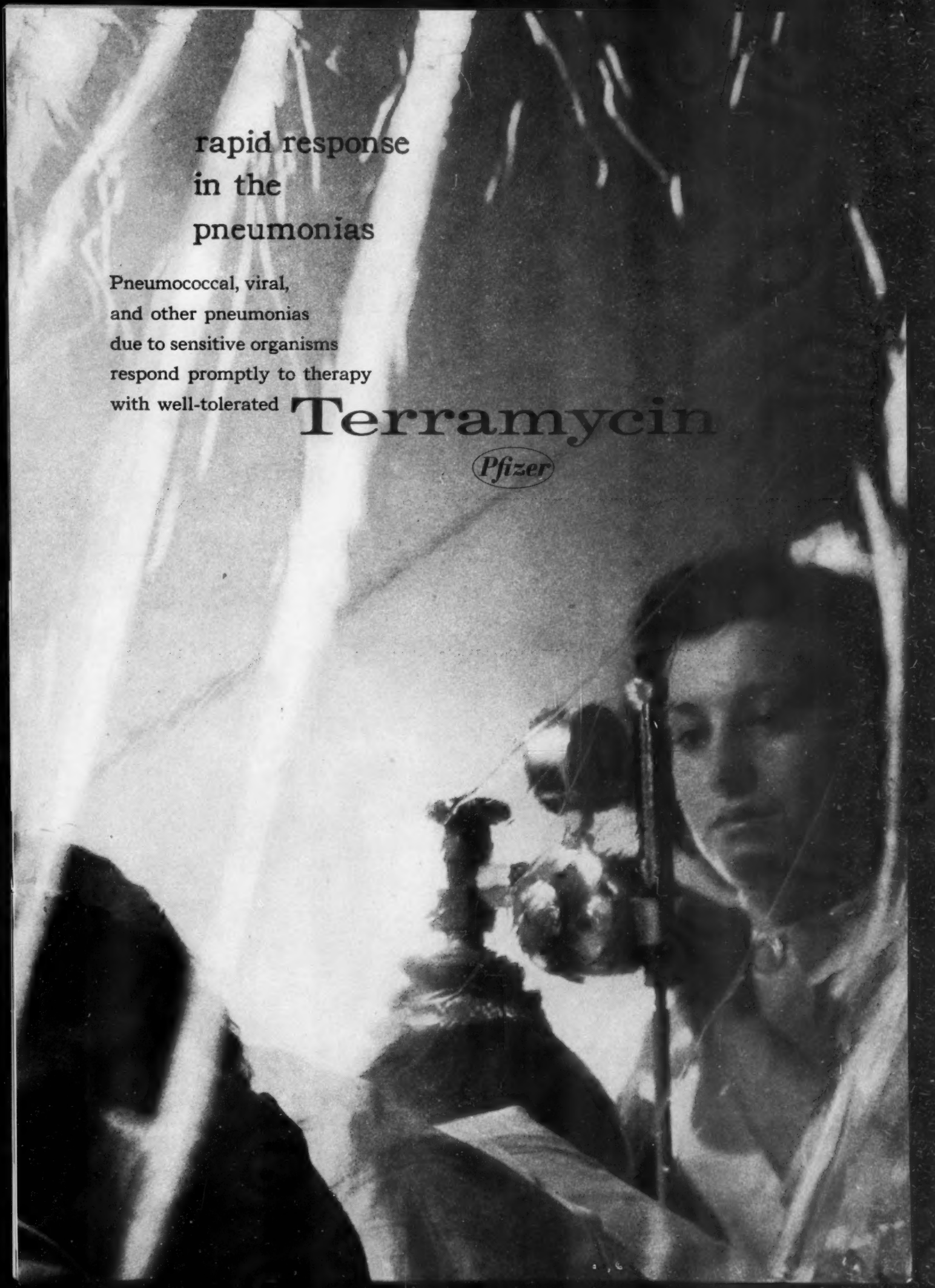
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REFERENCES:

*1. "Management of the Trochanteric Fracture of the Femur" by Mather Cleveland, M. D., David M. Bosworth, M. D., and Frederic R. Thompson, M. D. Journal of the American Medical Association, Volume 137 No. 14, July 31, 1948.

2. "The Treatment of Trochanteric Fractures" by Cecil E. Newell, M. D., American Journal of Surgery, Volume LXXIII, No. 2, February, 1947.

3. "One-Piece Angle Nail for Trochanteric Fractures" by Eugene Jewett, M. D. Journal of Bone and Joint Surgery, Volume 23 No. 4, October, 1941.

4. "The Treatment of Intertrochanteric Fractures of the Femur" by Walter G. Stuck, M.D. Surgery, Volume 15 No. 2, February, 1944.

5. "Introchanteric Fractures of the Femur" by Mather Cleveland, M. D., David M. Bosworth, M. D. and Frederic R. Thompson, M. D. The Journal of Bone and Joint Surgery, Volume 29 No. 4, October, 1947.

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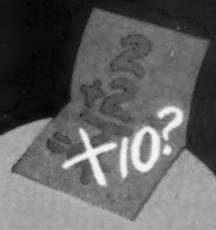

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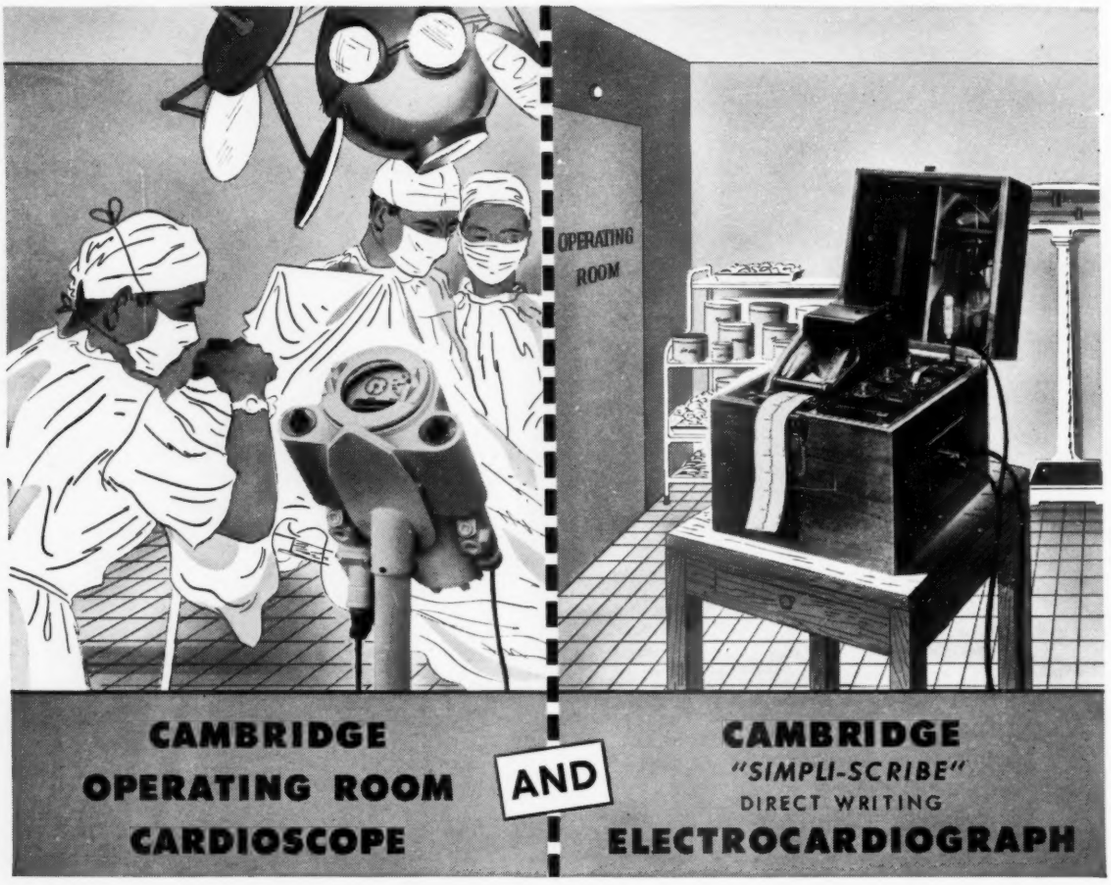

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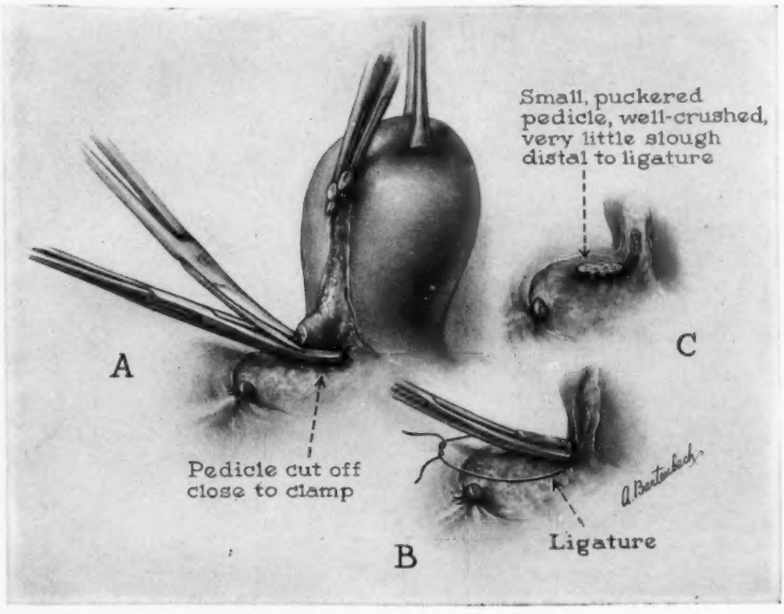

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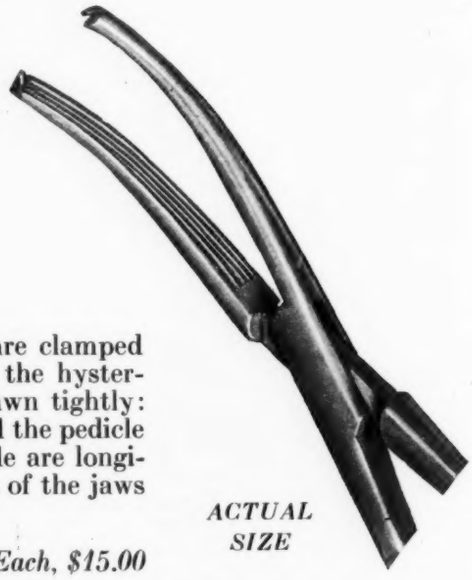

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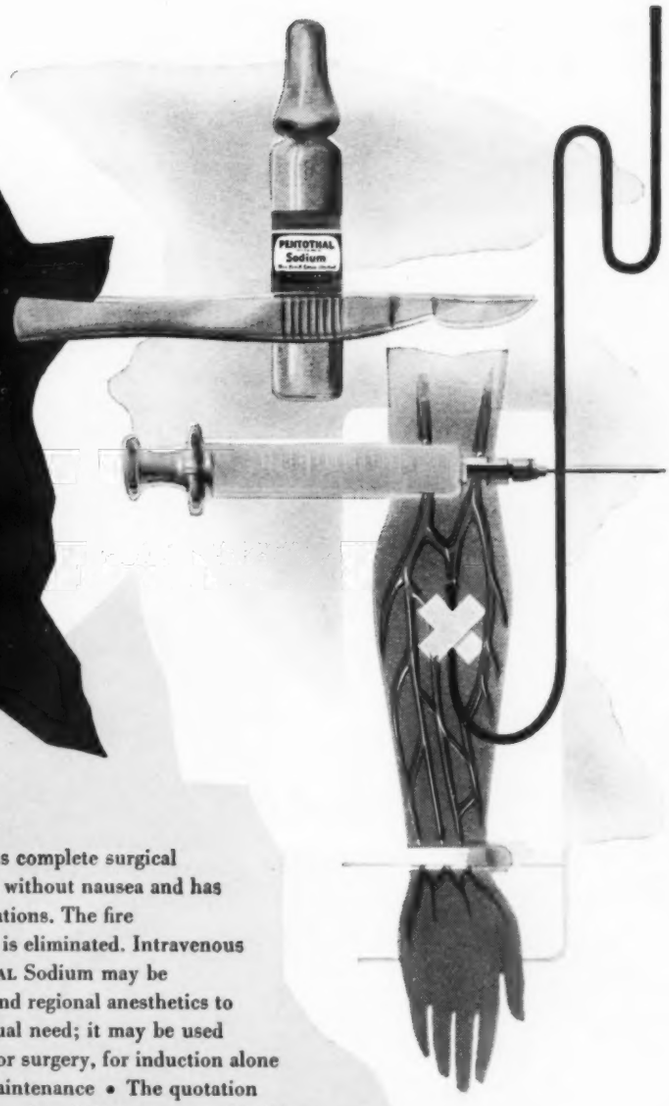
smooth and provides
adequate hypnosis."

—Leffingwell, F. E. (1950),
Pentothal—Its Uses and Abuses,
Medical Arts and Sciences, 4:53, No. 3



. . . and the patient has complete surgical amnesia, usually awakens without nausea and has fewer postoperative complications. The fire and explosion hazard is eliminated. Intravenous anesthesia with PENTOTHAL Sodium may be combined with inhalation and regional anesthetics to meet a specific, individual need; it may be used in minor and major surgery, for induction alone or induction and maintenance • The quotation above is from one of more than 1900 reports on the Abbott-developed ultra-short-acting barbiturate that have been appearing regularly in the world's medical journals for the past 18 years. Abbott

PENTOTHAL® Sodium

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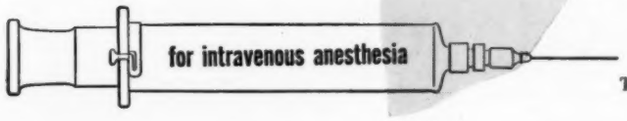

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Thirty-six pages discussing the clinical value of PENTOTHAL by rectum for pre-anesthetic hypnosis and basal anesthesia—results from nearly 4000 cases. Write to Abbott Laboratories, North Chicago, Illinois.

1-50

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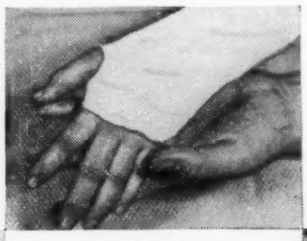
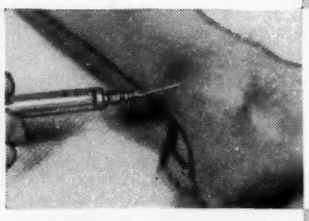
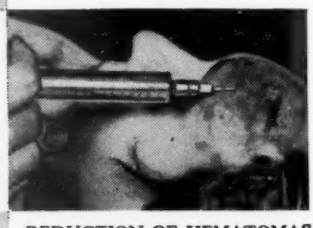


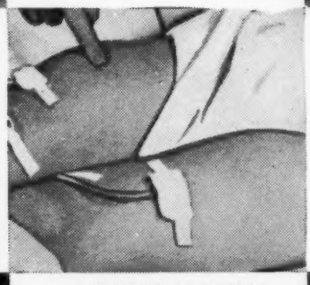
REDUCTION OF SIMPLE FRACTURES



TREATMENT OF SPRAINS



REDUCTION OF HEMATOMAS



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LOCAL ANESTHESIA

HYPODERMAL INJECTION OF CONTRAST MEDIA

Wydase softens tissue hyaluronic acid. This spreads *injected solutions* and *accumulations* of transudates and blood, facilitating their absorption.

Supplied: Vials of 150 and 1500 TR (turbidity-reducing) units.

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Lyophilized

Wydase®

Hyaluronidase

Important Note: Wydase is now Council-accepted for use in management of renal lithiasis.

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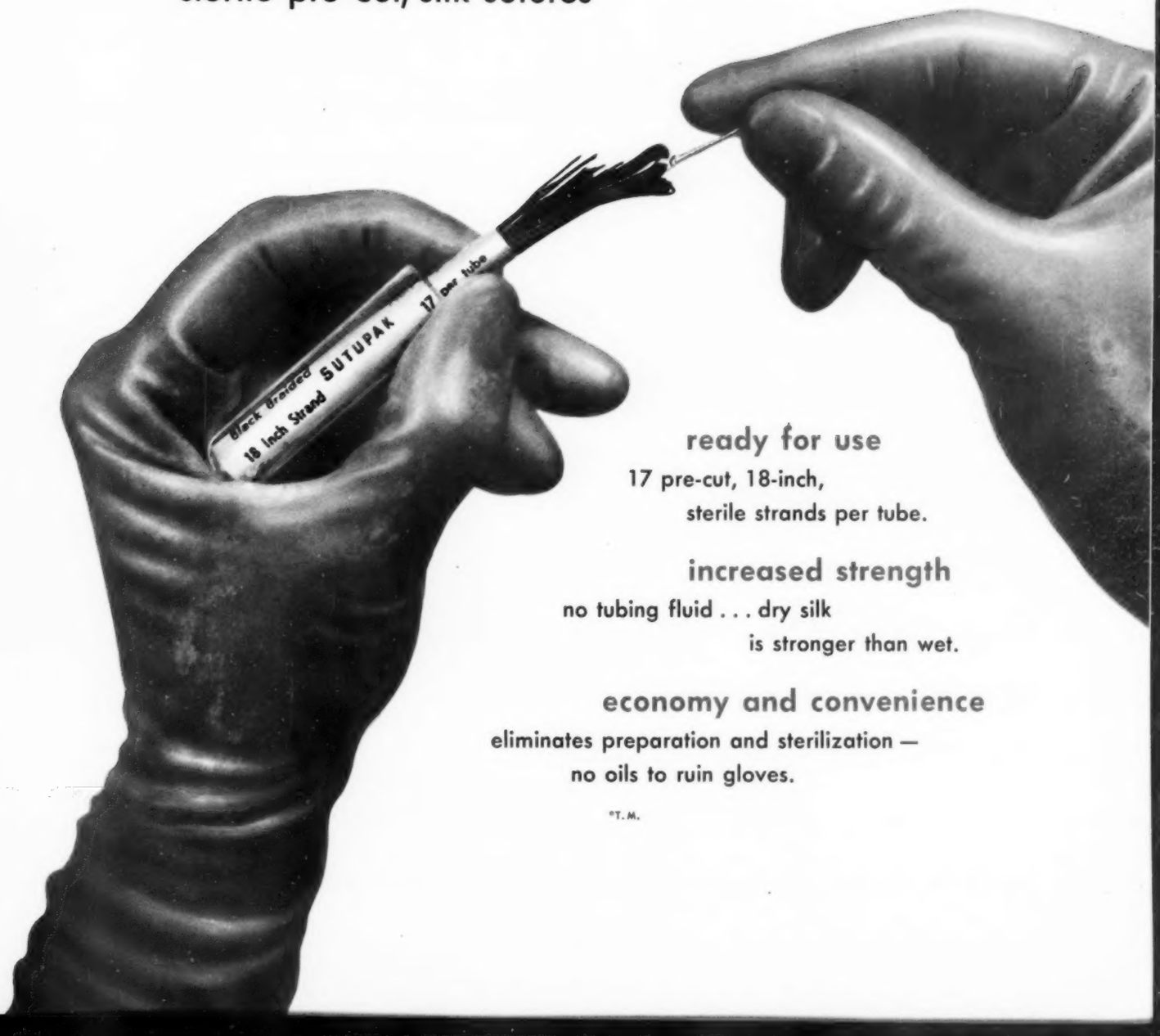
sterile pre-cut, silk sutures



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17 pre-cut, 18-inch,
sterile strands per tube.

increased strength

no tubing fluid . . . dry silk
is stronger than wet.

economy and convenience

eliminates preparation and sterilization —
no oils to ruin gloves.

*T. M.

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Ethicon Tru-Chromicized catgut is absorbed at a remarkably uniform rate, regardless of suture size.

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absorbable, non-antigenic dural substitute:

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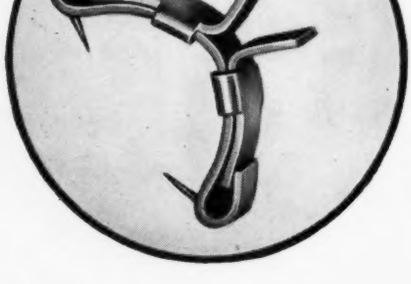
The Ants of the Amazon . . .

forerunners of the modern wound clip



Amazonian Indians used *sauba* ants to co-apt wounds—an ingenious and practical use of the fact that the ant's fore and hind pinchers held tightly after the ant's head had been removed.

Propper Serature Wound Clips use the same principle but more scientifically. Their advantages are:

- **minimal damage to skin edges**
- **easily adjustable *after* application**
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- **easy removal without cutting permits repeated use**
- **precision-made of inert 18% nickel silver**
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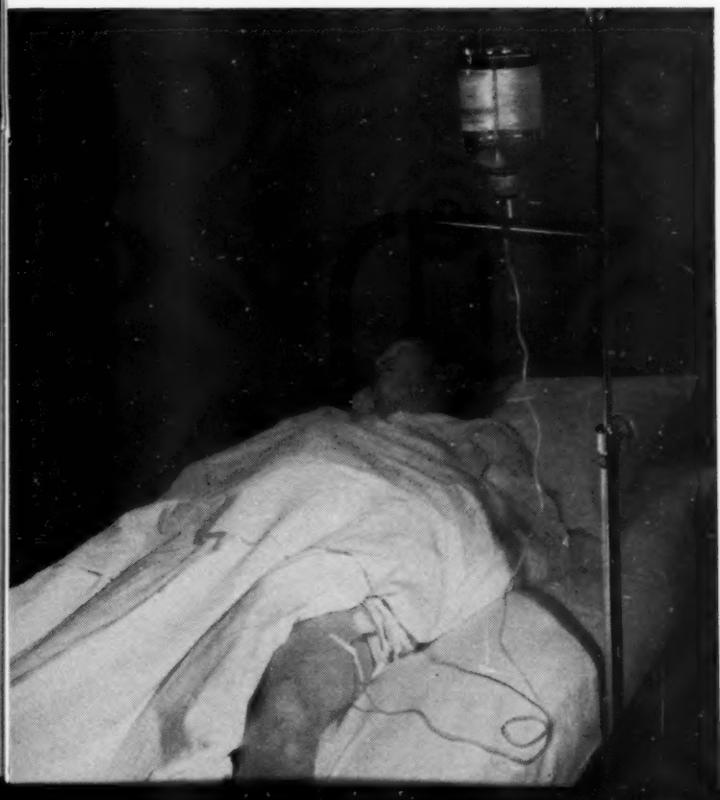
Use of Alidase® Permits Subcutaneous Administration of Fluids at Usual Intravenous Rates

In operative states—Alidase circumvents the complicating factors of venous thrombosis and "wornout" veins which frequently make fluid administration by vein difficult and dangerous. Simplicity and safety of Alidase make hypodermoclysis a method of choice for preoperative preparation and postoperative maintenance.

In burns—Plasma and electrolyte solutions can be given subcutaneously at effective rates when Alidase is employed; collapsed veins or risks of thrombosis are not a problem with this method.



Addition of Alidase to the first few cubic centimeters of fluid during hypodermoclysis speeds absorption to a degree approximating that of the intravenous route. Use of highly purified hyaluronidase in this manner avoids the well-known difficulties encountered with venoclysis, saves valuable nursing time and is more comfortable to the patient.

Hechter, Dopkeen and Yudell[1] have found that the use of hyaluronidase has "markedly increased the rates of absorption and administration of hypodermoclysis with no untoward reactions." They also found that extremely small amounts of this enzyme facilitated the absorption of fluids in that greater amounts of fluids were absorbed by the patient in a given period of time and that the localized swelling following hypodermoclysis disappeared more promptly.

Similar results with Alidase were recounted by Schwartzman, Henderson and King.[2] They observed "that absorption of various types of solutions, such as saline, glucose in saline, Hartmann's solution, Ringer's solution, penicillin, streptomycin, Adrenalin, and procaine was facilitated in every case."

In toxemias of pregnancy—Urgently-needed parenteral fluids may be administered subcutaneously with the aid of Alidase, eliminating risk of thrombosis attending repeated intravenous administration of electrolyte solutions. Alidase is the highly purified Searle brand of hyaluronidase and is accepted by the Council on Pharmacy and Chemistry of the American Medical Association.

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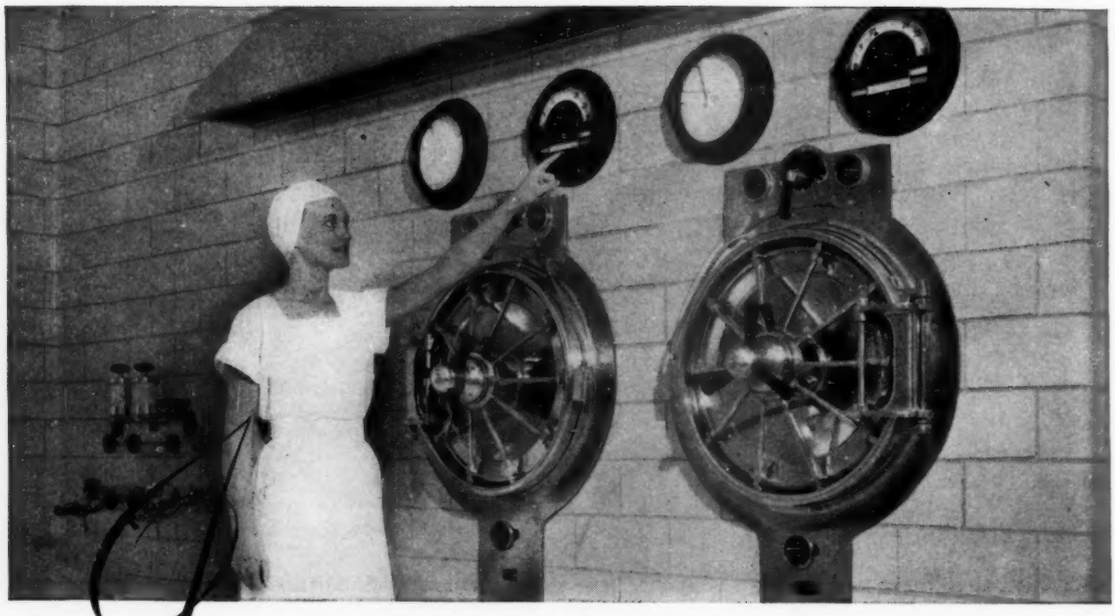
1. Hechter, O.; Dopkeen, S. K., and Yudell, M. H.: The Clinical Use of Hyaluronidase in Hypodermoclysis, J. Pediat. 30:645 (June) 1947.
2. Schwartzman, J.; Henderson, A. T., and King, W. E.: Hyaluronidase in Fluid Administration: A Preliminary Report, J. Pediat. 33:267 (Sept.) 1948.



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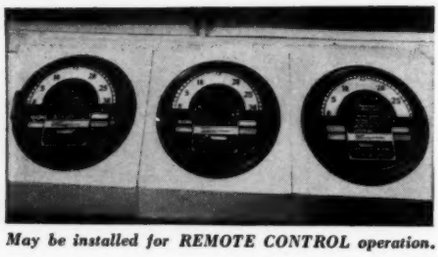
... ANOTHER EXCLUSIVE CASTLE *first*

OPERATES MANUALLY in event of power failure.



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in its most advanced stage of mechanical development (Sterilock), establishes a new high in patient-safety. It mechanically impounds the load from the instant the safety door is secured, and throughout the entire progressive phases of sterilization.

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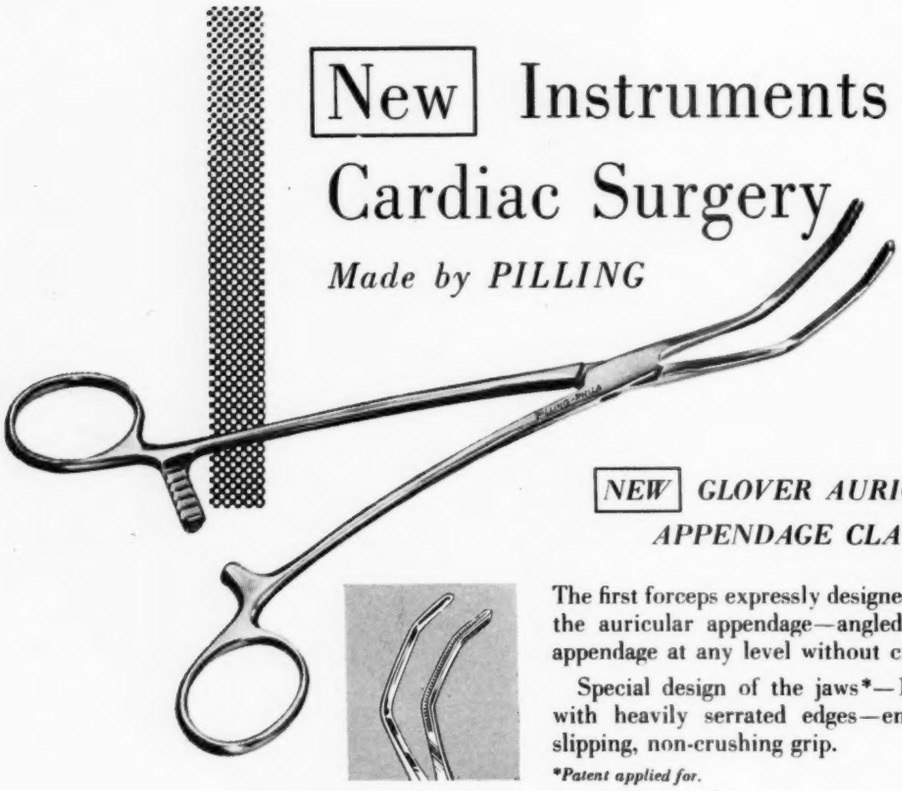
New Instruments for Cardiac Surgery

Made by PILLING



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The first forceps expressly designed for clamping the auricular appendage—angled to grasp the appendage at any level without crushing.

Special design of the jaws*—1 x 2 grooved with heavily serrated edges—ensures a non-slipping, non-crushing grip.

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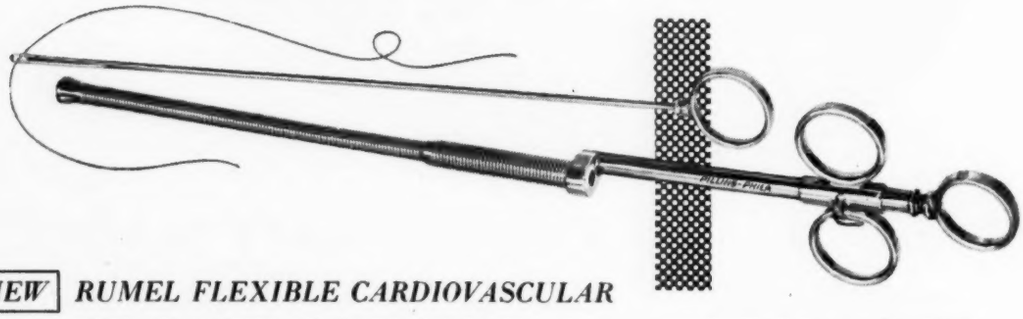
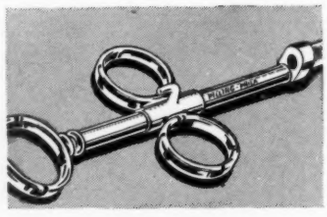


NEW ***RUMEL FLEXIBLE CARDIOVASCULAR TOURNIQUET with "eyed threader" for pulling suture through cannula.***



Specially designed to control tension on the auricular purse-string suture during mitral commissurotomy.

3-ring control and flexible cannula allow proper tension to be maintained with assistant's hands completely out of the wound.

Write for prices and descriptive literature which gives complete details.

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● **Headquarters for instruments for cardiac surgery**

more rapid relief of pain WITH THE **motorized intermittent tractolator***

WHEN CERVICAL TRACTION IS INDICATED

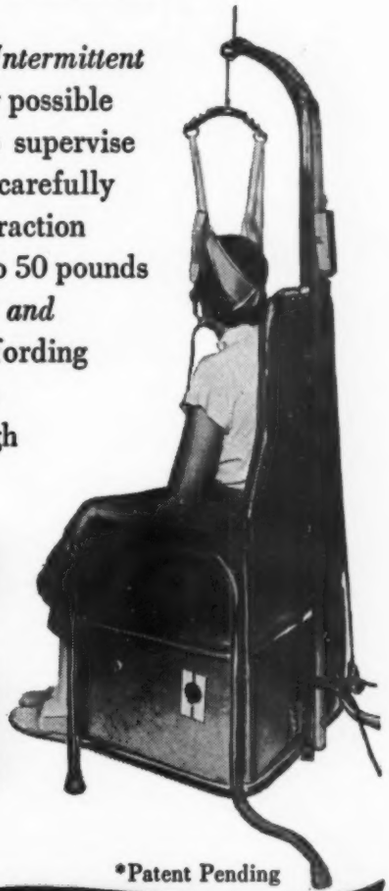
"Some patients who had previously received 5 to 8 pounds of constant traction without relief obtained rapid relief when 25 to 50 pounds of force were applied . . . Constant inadequate traction will not provide relief of pain; whereas adequate traction, even though applied intermittently, will often provide relief."

Intermittent Traction for Herniated Discs—by Bernard Judovich, M.D., Golda R. Nobel, M.D. Medical Times, Jan. 1952; Pain Syndromes—Bernard Judovich, William Bates. F. A. Davis Co., Philadelphia, 4th edition (in press) 1952.

Pain in the Shoulder, Neck, and Arm;
Brachial Plexus pain due to:

- **Herniated Cervical Disc**
- **Osteoarthritis of the Cervical Spine**
- **Narrowed Intervertebral Foramen**
- **Other Conditions in Which Cervical Traction is Indicated**

With the *Motorized Intermittent Tractolator*, it is now possible for the physician to supervise administration of a carefully graduated, smooth traction force with pulls up to 50 pounds . . . *safely, precisely and automatically* . . . affording relief of pain often unobtainable through other techniques.



Suitable for Hospital or Office Therapy

- *Comfortable*
- *Sturdy*
- *Automatic*

The *Motorized Intermittent Tractolator* is now in daily use in physicians' offices and hospitals. It is a dignified, handsome addition to your professional equipment, designed in consultation with the medical profession. Duration and amount of pull are automatic, once set for treatment. The apparatus is easily adjusted to the individual patient. Complete, simple instructions are provided with each Tractolator.

The *Motorized Intermittent Tractolator* is also available as a bed apparatus for cervical and lumbar traction. Details on request.

*Patent Pending

WRITE FOR INFORMATION, CASE HISTORIES, LITERATURE

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Surgical & Orthopaedic Appliances
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(Medical Tower Building)
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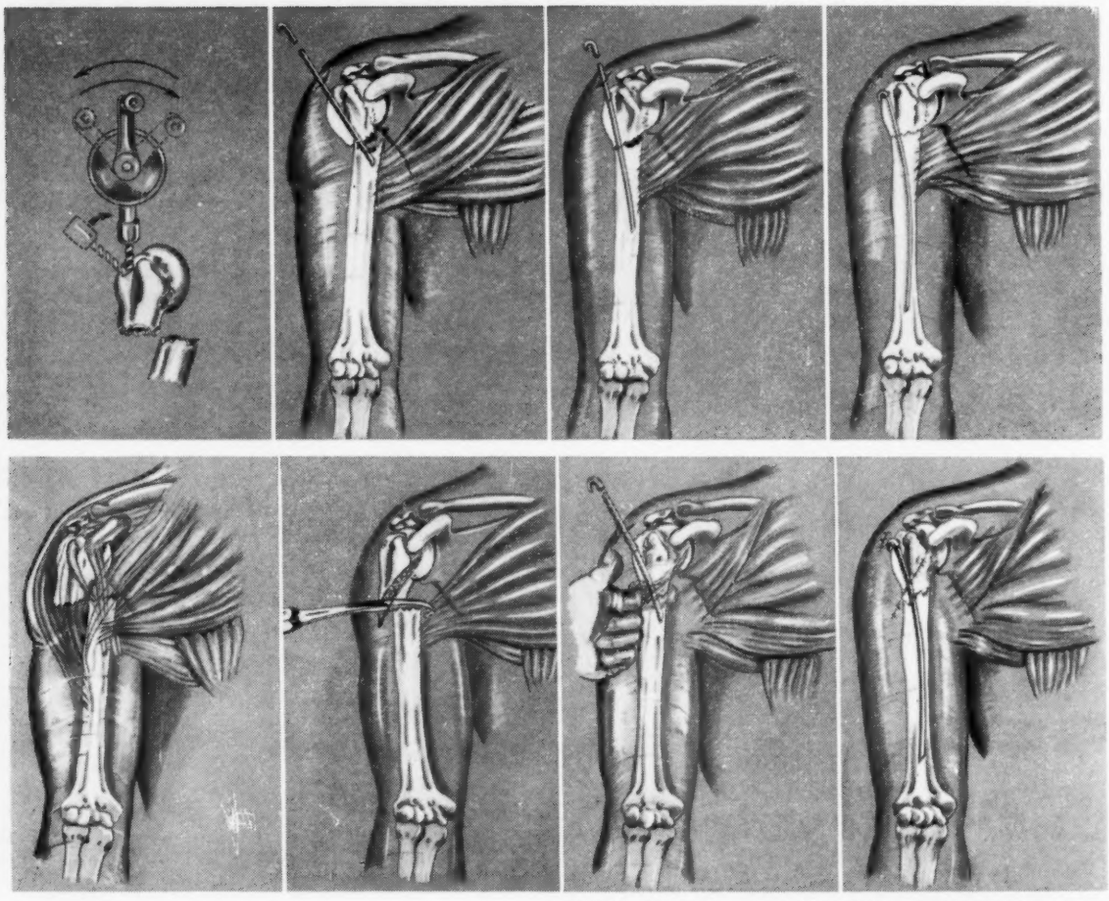
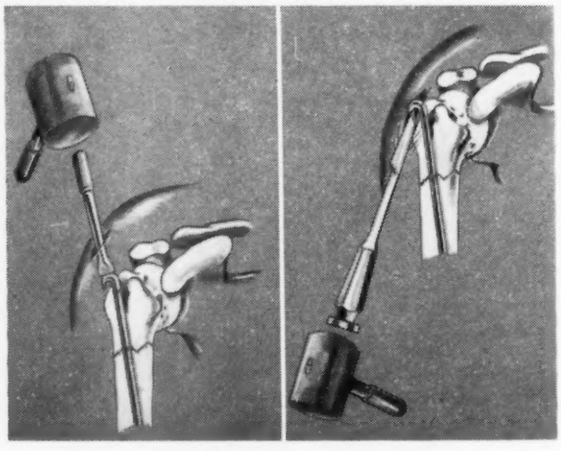
The RUSH MEDULLARY PIN

PIN-A-GRAM —HUMERUS—





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✓ ABOVE PINNING TECHNIQUES CAN USUALLY BE ACCOMPLISHED WITH CLOSED OR SEMI-OPEN REDUCTION.

✓ SIMILAR TECHNIQUES APPLICABLE TO ALL LONG BONES.

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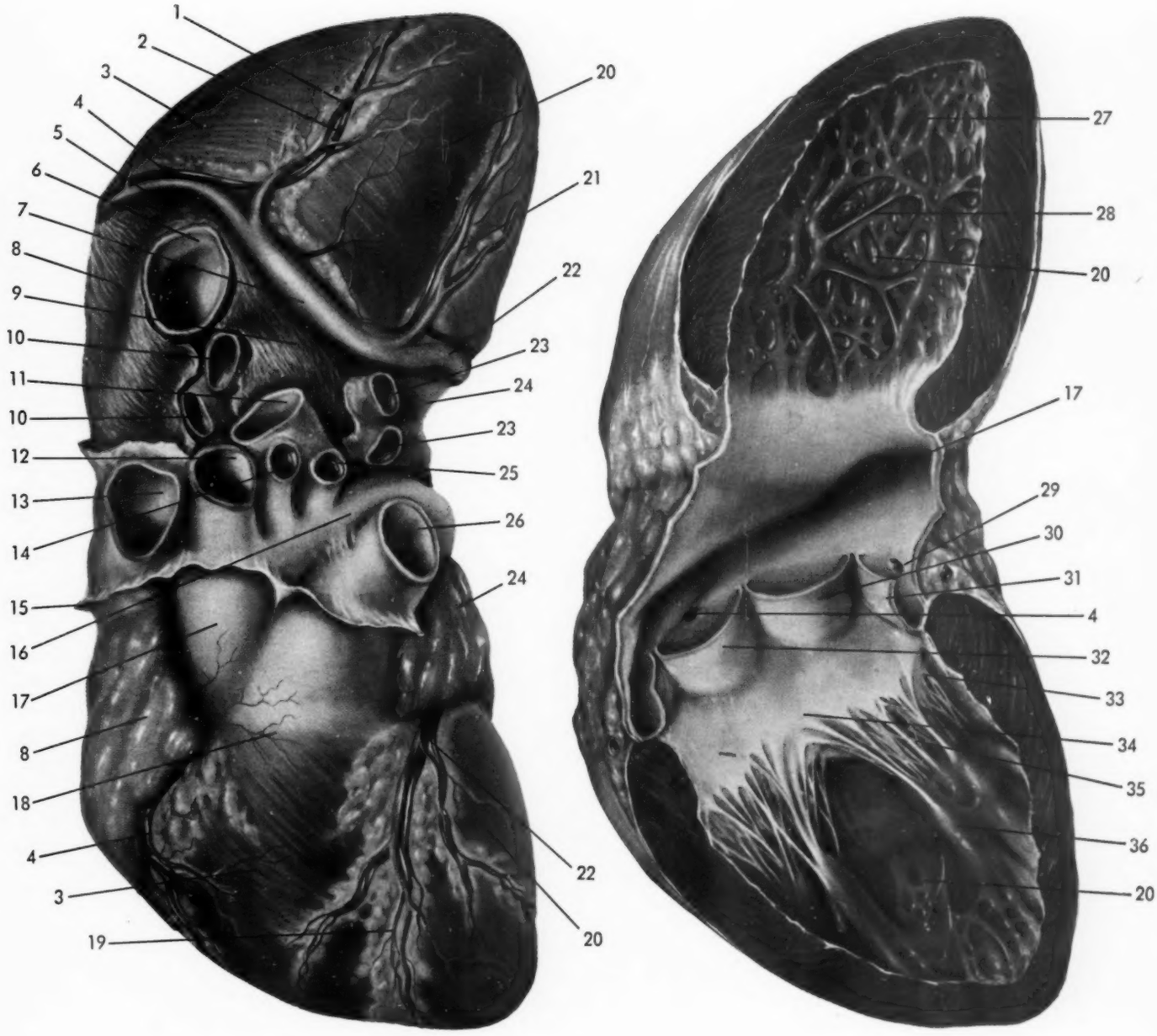
Anatomy *of the* Heart



1 Middle cardiac vein
2 Posterior descending branch of right coronary artery
3 Right ventricle
4 Right coronary artery
5 Small cardiac vein
6 Inferior vena cava
7 Coronary sinus
8 Right auricle
9 Left atrium
10 Right pulmonary vein
11 Right branch of pulmonary artery
12 Innominate artery
13 Superior vena cava
14 Left common carotid artery
15 Pericardium
16 Aortic arch
17 Ascending aorta
18 Conus arteriosus
19 Anterior descending branch of left coronary artery
20 Left ventricle
21 Posterior vein of left ventricle
22 Great cardiac vein
23 Left pulmonary vein
24 Left auricle
25 Left subclavian artery
26 Left branch of pulmonary artery
27 Trabeculae carneae
28 Trabecula tendinea
29 Left coronary artery
30 Posterior semilunar valve
31 Left semilunar valve
32 Right semilunar valve
33 Posterior cusp of mitral (bicuspid) valve
34 Anterior cusp of mitral (bicuspid) valve
35 Chordae tendineae
36 Papillary muscle

This is one of a series of paintings by Paul Peck, illustrating the anatomy of various organs and tissues of the body which are frequently attacked by infection, where aureomycin may prove useful.

Aureomycin
HYDROCHLORIDE CRYSTALLINE

in
Infections Involving the Heart

ENDOCARDITIS—Aureomycin has established itself as one of the most valuable agents available for the treatment of infections involving the heart. Aureomycin is now recognized as a highly effective antibiotic against the organisms most frequently encountered in endocarditis—staphylococci, *Str. viridans*, *Str. fecalis* and other enterococci. These organisms are being increasingly found resistant to penicillin and streptomycin. Endocarditis caused by these organisms has responded to aureomycin after failure of other antibiotics. Aureomycin is held by many physicians to be an antibiotic of choice for prophylactic use in patients with organic cardiac disease who require oral, intestinal, or rectal surgery, or any transurethral operative procedure. Endocarditis complicating typhus and brucellosis has responded well to aureomycin therapy.

PERICARDITIS—The importance of aureomycin in pericarditis has been demonstrated by its successful use after failure of other therapy—in acute nonspecific pericarditis, possibly of viral etiology; *H. influenzae* pericarditis; tularemic pericarditis; and actinomycotic pericarditis.

RHEUMATIC FEVER—Because aureomycin is an antibiotic with a wide range of effectiveness against the pathogenic strains of streptococci, its use has been recommended for the prevention of acute rheumatic fever and its cardiac complications.

* * *

PACKAGES: *Capsules:* 50 mg.–Vials of 25 and 100; 100 mg.–Vials of 25 and bottles of 100; 250 mg.–Vials of 16 and bottles of 100. *Ophthalmic Solution:* Vials of 25 mg.; solution prepared by adding 5 cc. distilled water.

LEDERLE LABORATORIES DIVISION
AMERICAN Cyanamid COMPANY
30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y.

A bibliography of 39 selected references will be mailed on request.

Reduces risk of Peritonitis

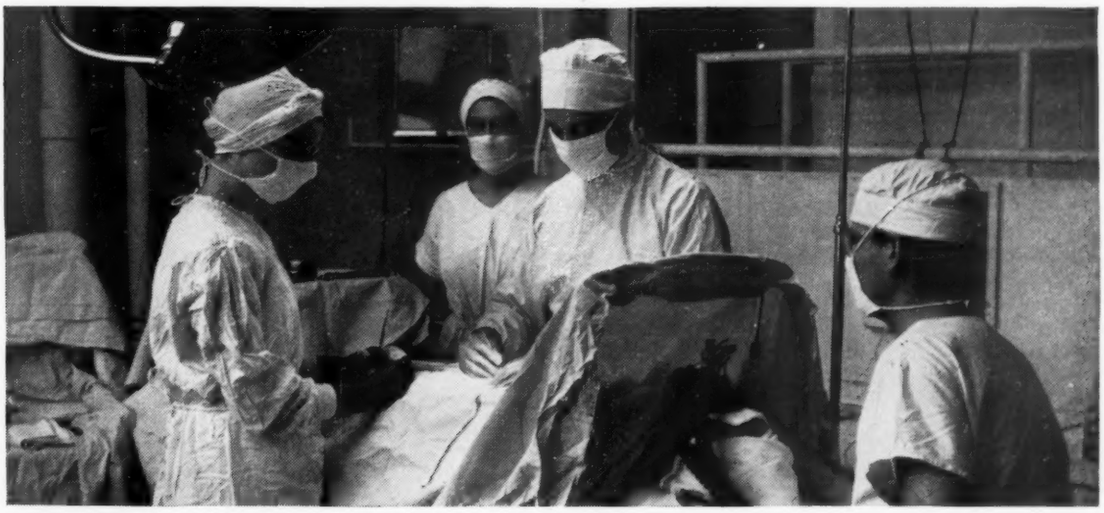
95 per cent of SULFASUXIDINE dose remains concentrated in the bowel.

SULFASUXIDINE® markedly reduces the coliform flora of the intestines, and also tends to alter the feces to a semiliquid state.

Therefore, SULFASUXIDINE affords an effective means of cleansing the bowel both bacterially and mechanically in preparation for surgical procedures.

Since systemic absorption of SULFASUXIDINE is so slight, toxic reactions to therapeutic doses are rare.

SULFASUXIDINE is supplied as 0.5 Gm. tablets, in bottles of 100, 500 and 1,000, and in powder form, in ¼ lb. and 1 lb. bottles. Sharp & Dohme, Philadelphia 1, Pa.



Postoperative complications have been greatly reduced by advanced surgical techniques. Since "... a clean bowel has top priority in this respect,"[1] antibacterial SULFASUXIDINE *helps reduce complications further.*

Sulfasuxidine®

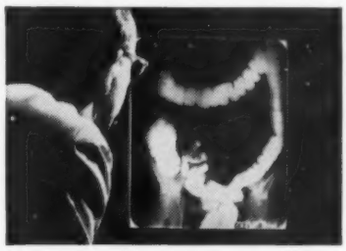
SHARP & DOHME

SUCCINYLSULFATHIAZOLE

"The preparation of the gastrointestinal tract is a most important adjunct contributing to a successful outcome."[1]

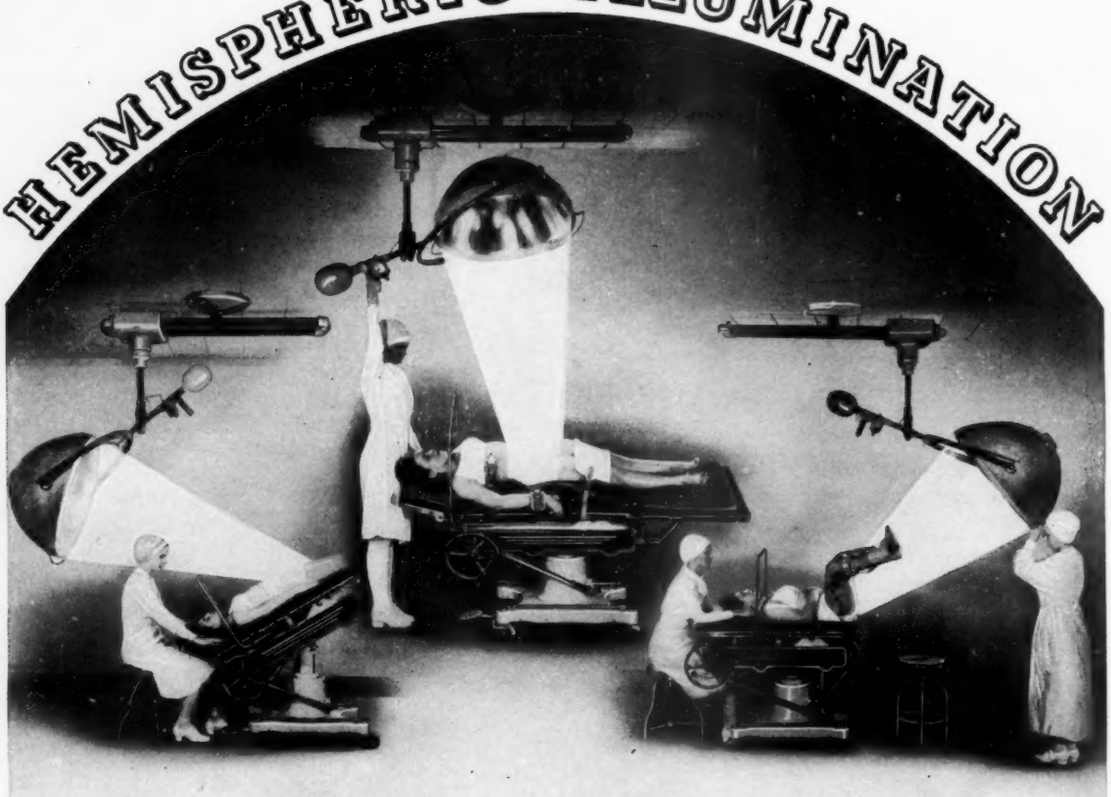
1. Ault, G.W.: Southern M.J. *44*:737, 1951

Administered postoperatively, SULFASUXIDINE *maintains a low enteric bacterial count, resulting in less distension, gas pains and nausea. Convalescence is speedier, simpler.*



In addition to its pre- and postoperative use, SULFASUXIDINE *may also be of value in ulcerative colitis, ileitis and ileojejunitis.*

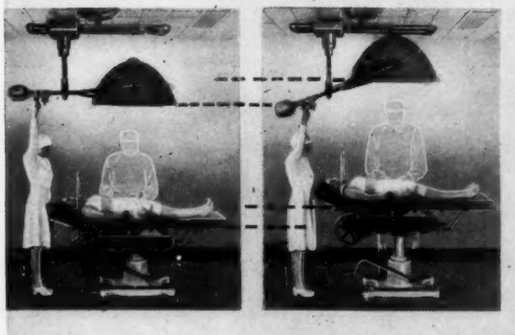
HEMISPHERIC ILLUMINATION



. . . direct light-beam approaches in all surgical postures from any desired position in the horizontal and vertical planes.

The "American" MAJOR SURGICAL LUMINAIRE

(Model DMCA)



in addition to its exclusive Head-End and Dual Control feature permitting constant wound observation and accurate beam redirection from outside the sterile area, offers VERTICAL HEIGHT ADJUSTMENT over the operative site . . . fundamental compensation that alone insures maximum Foot-Candle intensity at varying Table elevations.

CHOICE OF 3 INTENSITIES
of cool illumination with equal shadow reduction to compensate for varying incision characteristics.

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HEMOSTATIC BAG CATHETERS

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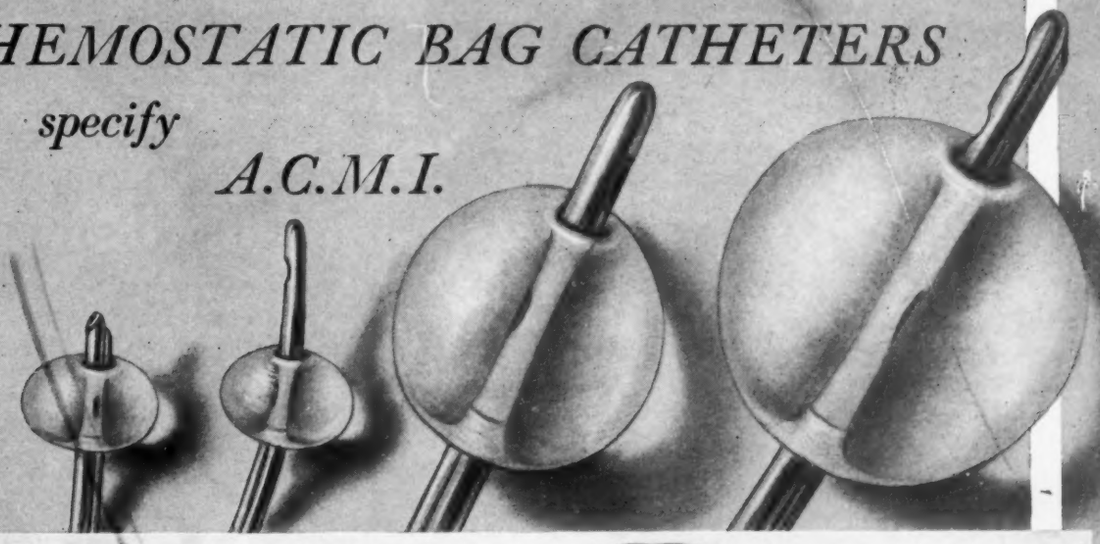

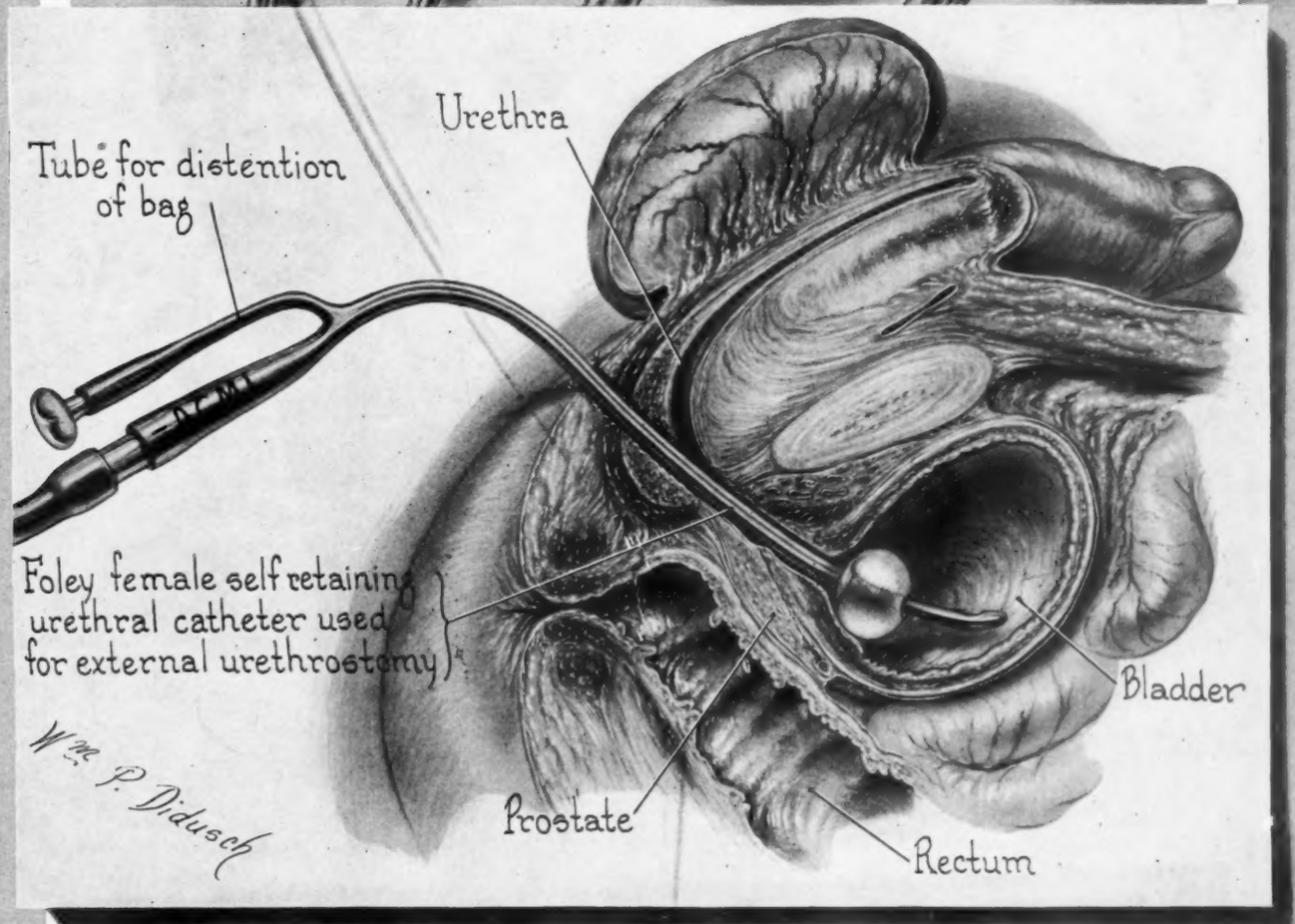

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FREDERICK J. WALLACE, *President*

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Koagamin Controls Post-Tonsillectomy Bleeding

Spontaneous or postoperative bleeding may be controlled with KOAGAMIN easily and quickly.[1] It has been found especially effective in post-tonsillectomy bleeding for its double action — decreasing coagulation time,[2] and increasing clot resistance even in hemophiliacs.[3]

KOAGAMIN'S direct action on the blood and tissue fluids renders it more useful than vitamin K, effective only when blood prothrombin is low. In such cases, KOAGAMIN is recommended in conjunction with slower-acting vitamin K to effect faster control.

KOAGAMIN®

(An aqueous solution of oxalic and malonic acids for parenteral use)
In 10 cc. diaphragm-stoppered vials.
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THERAPEUTICALLY aids control of bleeding gastric and duodenal ulcers, hematemisis, hematuria, uterine bleeding, the dyscrasias, etc.

PREOPERATIVELY minimizes oozing, assures a clearer surgical field.

POSTOPERATIVELY controls secondary bleeding.

1. Hollender, A. R. Office Treatment of Nose, Throat and Ear, 1943, Year Book Publishers, Chicago, p. 200.
2. Martin, G. J. Am. Jl. Physiol. 130:574, 1940.
3. Copley, A. L. and Lalich, J. J. Am. Jl. Med. Sci. 204:665, 1942.

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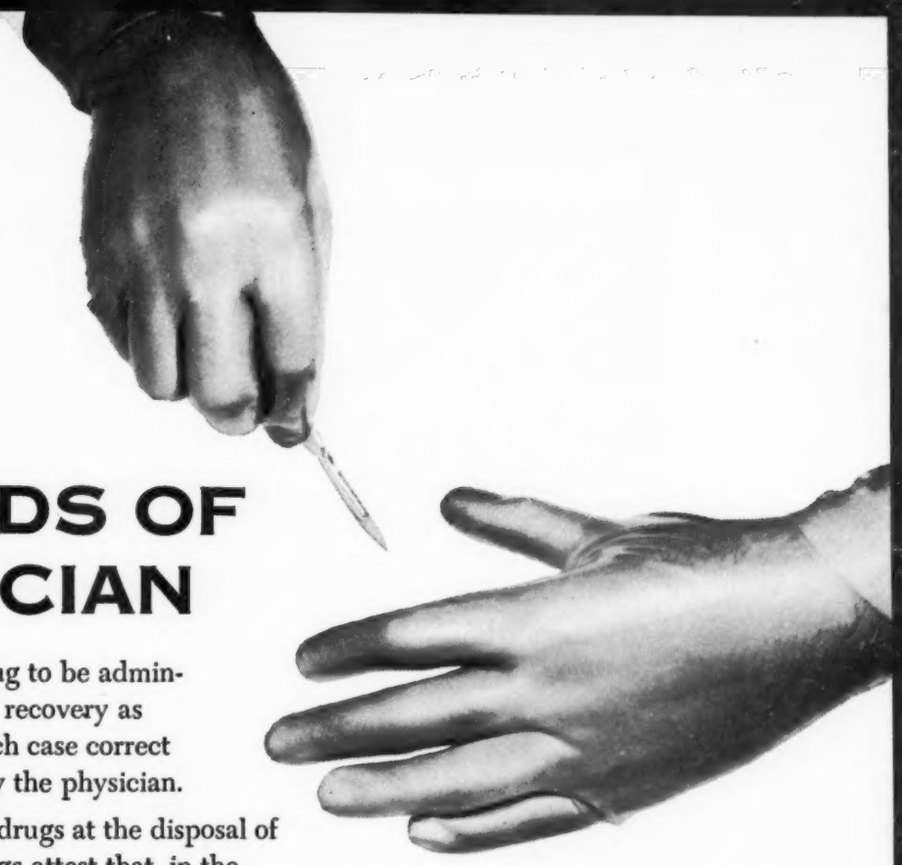

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Mechanism of Blood Coagulation in Normal and Pathologic Conditions

MARIO STEFANINI

New England Center Hospital—30 Bennett Street—Boston, Mass.

A brief historical background and a critical discussion of present concepts of the coagulation mechanism, the various coagulation factors and the mechanism of hemostasis. A brief outline of parallel or confusing nomenclature. Outline of the various clinical entities resulting from aberrations at different phases of the mechanism with remarks upon diagnostic laboratory procedure. (Perhaps the latter two in tabular form.)

Prothrombin and Accessory Factors. Clinical Significance

DR. PAUL A. OWREN

Dept. of Medicine—University of Oslo—Rikshospitalet—Oslo, Norway

A discussion of the present state of knowledge of prothrombin, its conversion and role in the coagulation mechanism, and the accessory factors concerned with this phase of the coagulation mechanism. A discussion of the clinical hemorrhagic entities, congenital and acquired, related to defects in prothrombin and its accessory factors.

Hemophilia

DR. ARMAND QUICK

Marquette University Medical School, Milwaukee, Wisconsin

A discussion of hemophilia including the clinical picture with emphasis on the present concept of the basic defect in the clotting mechanism, the question of acquired anticoagulants, genetics, specific therapy (including plasma fractions) and over-all management.

Thrombocytopenic Purpura

DR. EUGENE LOZNER

New York State Medical School, Syracuse, N. Y.

A discussion of the entities including the clinical picture (acute, chronic, congenital), present concepts of etiology and pathogenesis, with remarks upon recent work in immuno-humoral mechanisms and platelet survival transfusions; a discussion of management including indications and effect of transfusion, splenectomy, ACTH and cortisone therapy.

Allergic Purpura, Including Purpura Due to Foods, Drugs and Infections

DR. J. F. ACKROYD

St. Mary's Hosp. Paddington, London W2, England

A discussion of the entities, including the clinical pictures with remarks upon the various drugs and allergens which have been implicated; a discussion of mechanism with remarks on Dr. Ackroyd's classic work in Sedormid Purpura; Henoch-Schönlein purpura, etc. Vascular factors as opposed to platelet deficiencies—management of these disorders.

Anticoagulants and Anticoagulant Therapy

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New York Hospital, New York

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Sixty-second Year of Publication

VOL. LXXXV JANUARY, 1953 NUMBER ONE

Editorial

TWENTY-FIVE YEARS

WITH this issue of *The American Journal of Surgery* we have completed twenty-five years as its Editor. We took over with the January, 1928, number. Hoover was beginning his term as President. The times were lush; stocks were soaring. In many places physicians were speculating and becoming wealthy . . . on paper. The deluge was just around the corner. In those days there was no shortage of interns, residents or nurses. Little was heard of mounting hospital deficits. There was one American Board. Beginning about 1930 many other Boards were organized. There were those who said that medicine had about reached its peak: there was so little left to discover. Of course not much was known about cancer, hypertension, lung tumors and many things which today are on their way to solution or have been solved and are routine.

We have looked over our bound volumes for the first two or three years and were impressed with the outstanding men on our Editorial Board. Many of them became our friends. At that time most of these men were in their prime, middle-aged. Like falling leaves, they passed on or resigned. Only recently Carl Beck of Sayre, Pennsylvania, and Adrian V. S. Lambert of New York died. They were with the *Journal* for over twenty-five years. Only four men who were on the Editorial Board when we assumed Editorship are still family members: James T. Case of Santa Barbara, California, Donald Guthrie of Sayre, Pennsylvania, Urban Maes and Rudolph Matas of New Orleans. Dr. Matas, whom many vote the most outstanding living surgeon of the past six decades, has been a cooperative friend. Hubert A. Royster of Raleigh, North Carolina, now retired, writes to us now and then. We cannot mention all who were friends and gave freely of their advice and criticism, but we keep a warm spot aglow for George Crile, John B. Deaver, Charles Elsberg, A. E. Hertzler (he was "something"), M. G. Seelig, H. Stander, J. Bentley Squier, Frederick Holden, Roy D. McClure, John O. Polak and Elliott C. Cutler. We miss every one of them.

During our time as Editor medicine has been in a process of fast evolution. It has been a golden era of wonderful new discoveries. Space does not allow us to mention all or to go into detail, hence we list but a few.

First, the sulfa drugs and the many antibiotics came into general use. These wonder drugs changed the surgical structure and many procedures are now attempted with relative safety in cases previously considered inoperable or most likely to end listed in the mortality column.

Although spinal anesthesia was used by a handful of men here and there, it was not in common use. In 1928 Pitkin devised what he termed "controllable spinal anaesthesia" and demonstrated it on patients at the meeting of the American College of Surgeons in Boston. It caught on like wildfire. In December, 1928, we devoted an entire issue to spinal anesthesia, publishing fifteen articles and a long letter from Rudolph Matas. Our circulation doubled. In an editorial in that issue we read, "spinal anaesthesia has passed the threshold of doubtful

applicability and is about to receive wide recognition (sic)." Today anesthesiology is an important and fast growing specialty. The old days of a raw intern administering ether or chloroform on a soaked mask is on the shelf with the extinct dodo bird. Along with sulfa drugs and the antibiotics modern methods of various types of anesthesia have done much in reducing surgical mortality and morbidity. We now have carbon dioxide absorption, cyclopropane, curare-like drugs, continuous spinal anesthesia, endotracheal anesthesia and more physiologic application of anesthetic drugs and technics.

Today the urologist employs hormone therapy in carcinoma of the prostate. Other advances in this specialty within the last two decades have been transurethral resection, studies in adrenal disease and their clinical application, urology in children, and greater conservatism in urosurgery, notably the kidney. In 1930 we published the first article by Swick on what was then called Uroselectan, used in intravenous urography.

The field of obstetrics has marched forward with giant strides. A quarter of a century ago maternal mortality in the United States was disgraceful. Today maternal mortality in this country is as low as that of any civilized country. This has been due to prenatal care, better teaching, conferences, the residency system and physicians who have been better trained. Pelvimetry has done much to make for more living, healthy babies. Not too long ago cesarean section was an operation of last resort and the mortality was high. Today, aided by sulfa drugs and antibiotics plus modern and better operative technics, cesarean section is more than a relatively safe procedure; it is safe.

In orthopedics there have been impressive advances in early diagnosis and treatment of tuberculosis, improvements in the treatment of fractures (intramedullary nail for fracture of femur), and a better understanding of the treatment of traumatic and hemorrhagic shock with whole blood and blood substitutes. (This is true of all the surgical fields.) Present day knowledge of congenital hip and hip prosthesis, and diagnosis and treatment, in ruptured vertebral discs have undergone revolutionary changes.

In gynecology one is impressed with the necessity and methods of diagnosing early malignancy, especially of the cervix. Operation in early cases, aided by radium and x-ray, has cured many and prolonged the lives of untold numbers. However, the cancer problem as a whole is still far from solution. The standardization of procedures in vaginal plastic surgery has been marked. Vaginal hysterectomy, although carried out for years, today is a surgical commonplace. Due to improvements in blood transfusion, radical panhysterectomy and pelvic node excision have lost their terrors. Also, the work on endometriosis with increased recognition of that entity, advances in reproductive endocrinology with less striking advances in endocrine therapy, improvements in the management of sterility and increased conservatism in the management of pelvic inflammatory disease have done much in making the woman of today healthier and happier.

In the field of goiter we now have radioactive iodine (I^{131}) and many new antithyroid drugs, of which the most commonly used is propylthiouracil. Patients with hyperthyroidism, particularly of the severer grades (Graves' disease), are more satisfactorily prepared for operation, and the test for thyroid function by the determination of the protein-bound iodine (P. B. I.) is more accurate than the basal metabolism test.

There have been certain advances in the technic of neurosurgery but great advances have been made in methods of diagnosis. Cerebral angiography and electroencephalography are outstanding examples. Now prefrontal lobectomy is an accepted procedure.

Who ever thought twenty-five years ago that partial or complete pulmonary lobectomy would be a daily occurrence? Early malignancies, bronchiectasis, benign growths and tuberculosis now are often treated by the surgical approach.

The same is true of blood vessel surgery. Great strides have been made, many of them in fairly recent times. The newer surgery of the heart is a dramatic chapter in surgical progress, and the end is not in sight.

James T. Case enumerates the outstanding advances in roentgenology as follows: (1) Enormous advances in the use of contrast materials introduced into the various accessible organs of the body through natural openings or through fistulas. (2) The development in roentgen and radium therapy including the universal use of the r unit as measurement of dosage, both for roentgen rays and radium. The elaboration of the means for measuring the tissue

dosage and the universal adoption of tissue dose measurement in roentgen and radium therapy. There is a very steady but definite tendency to the use of higher voltages in roentgen therapy with leaders in radiotherapy now conceding the desirability of million-volt machines for deeper-seated lesions. (3) The medical use of radioactive isotopes, both for research and for therapy. (4) Development of angiocardiography, in the connection of which much credit must be given to the Cuban colleagues, especially Castellaños and Perieras.

An artificial heart and an artificial kidney are almost realities. When fully perfected they will play an important role in the newer surgery. Among other innovations that have been steps forward are early ambulation, newer and improved surgical instruments, revolutionary changes in operating-room equipment, blood banks, and great progress in the quality and the many types of sutures. The manufacturers of surgical sutures are to be complimented. Think back twenty-five or forty years. We in 1953 live in a time as different from 1928 as that year was different from 1878.

We have been most fortunate that it was our lot to be born and to have lived during this marvellous surgical age. We have thoroughly enjoyed our avocation of editing this *Journal.* Although at times the task of reading thousands of manuscripts has been irksome, that reading rewarded us often with many pleasant and at times exciting hours.

We, too, were fairly young (in the middle years) when we started with the *Journal.* We realize we have journeyed up the mountainside and are almost at the top where the shadows are deepening. By the law of averages we will not be around twenty-five years from now, but before our end we hope many of the apparently insolvable problems of the present day will be answered.

Enough of this somewhat nostalgic contemplation. We start off on another quarter century. To you all . . . a Happy New Year of Health, Contentment and Peace.

T. S. W.

Original Articles

DYSGERMINOMA OF THE OVARY*

RICHARD F. LOOKER, M.D., WILLIAM P. CALLAHAN, JR., M.D. AND FRANCIS E. BARRY, M.D.

Wichita, Kansas

THE term dysgerminoma was first proposed by Robert Meyer[1] in 1931, who postulated that this ovarian neoplasm arose from neuter germ cells and differentiated without affinity for either sex. Previously a variety of descriptive names had been applied to the tumor including embryonal carcinoma, large cell carcinoma of the ovary and "seminoma ovarii," because of the morphologic similarity to the seminoma of the testis.[1] To date 427 cases of dysgerminoma of the ovary have been recorded in the world literature and it comprises approximately 3 per cent of all solid ovarian tumors. The majority of studies have been isolated case reports and as a result the evaluation of the methods of treatment have been incomplete.[2] The type of surgical treatment in the reported cases has varied from simple extirpation of the tumor to the more rarely employed radical procedures.

During the past two years we have encountered three cases of dysgerminoma of the ovary and this stimulation to our interest has led us to search the literature to determine the proper management of these and future cases. The conflicting opinions which were encountered led us to a more thorough study and review of the files in St. Francis Hospital for more examples of this type of tumor. Two additional cases were identified and follow-up information concerning the patients was obtained. All cases were treated with conservative surgery consisting of removal of the tumor. Only one of the patients (Case v) received radiation therapy. The information obtained was contradictory to many previously reported studies. Although the number of cases is small, the analysis offers satisfactory information concerning the natural history of the disease following minimal therapeutic procedures. A similar study has recently been completed by Pedowitz and Grayzel,[3] with comparable results.

The histologic study of many types of ovarian tumors during our search for cases of dysgerminoma has led us to propose a working hypothesis for the classification of solid ovarian tumors and to set forth our ideas of the histogenesis of these tumors.

CASE REPORTS

CASE I. A fourteen year old white girl was first seen at the St. Anthony's Hospital, Hays, Kansas, in 1935, complaining of pain and swelling in the lower abdomen. There was no abnormal vaginal bleeding or menstrual irregularities. Physical examination revealed a large mass in the pelvis which could be separated from the uterus. Surgical exploration of the mass was performed by Dr. D. D. Blake. A large solid tumor of the left ovary was found and a unilateral oophorectomy performed. The patient expired two months postoperatively of metastasis. Permission for autopsy was not obtained.

Pathologic report revealed that the specimen consisted of a large grayish white ovarian tumor weighing 14.5 pounds, with numerous regions of necrosis. Microscopically, the tumor was composed of cells with oval, deeply basophilic nuclei and an abundance of acidophilic cytoplasm. The chromatin material of the nucleus presented a regular distribution. The cells were somewhat smaller than those seen in the typical dysgerminoma. The tumor cells were arranged in nests and cords which were separated by septa of fibrous connective tissue. The lymphoid stroma was present, but not

* From the Department of Pathology, St. Francis Hospital, Wichita, Kan. Aided by a grant from the Kansas Division of the American Cancer Society.

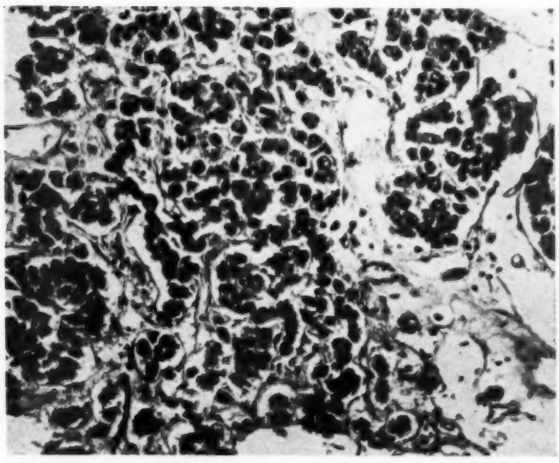

FIG. 1. Case I. Microscopic section; zone of medullary arrangement of tumor cells with small amounts of stroma. Although regions such as this are very cellular, few mitotic figures are present. Hematoxylin and eosin stain, × 200.

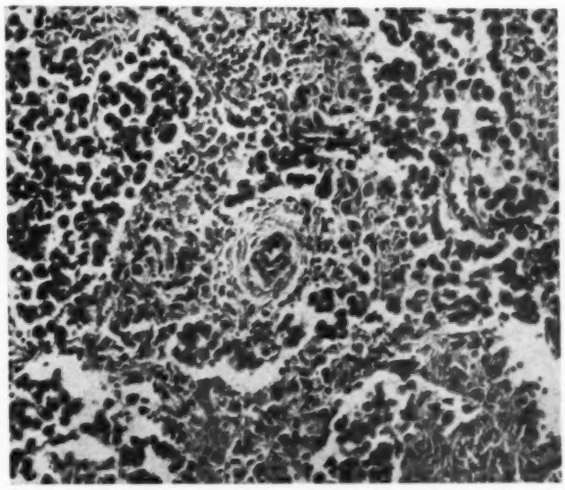

FIG. 2. Case II. Arteriole with intimal hyperplasia. There is proliferation of stromal cells which have produced an abundance of reticulum fibers demonstrable with special stains. Hematoxylin and eosin stain, × 200.

prominent. Only occasional mitotic figures were present. Within some zones of the tumor the septa were thick and completely divided the tumor cells into numerous aggregates of varying size. In other regions they were thin and only incompletely separated the nests of tumor cells. Scattered throughout the tumor were numerous small zones of necrosis. (Fig. 1.)

CASE II. A twenty-two year old white woman was admitted to St. Francis Hospital in 1948. She had experienced vague lower abdominal pain for one year. A large, firm mass was palpable on bimanual pelvic examination in the left adnexa. A Friedman test was negative. There had been no abnormal vaginal bleeding. Surgical exploration was performed by Dr. S. L. Stout and a tumor was found replacing the left ovary. A left salpingo-oophorectomy was performed. No postoperative radiation therapy was given. The patient is alive and well four years after operation with no evidence of recurrence. Menstrual history is normal.

Pathologic report revealed that the specimen consisted of a large ovarian tumor measuring 9.5 by 8 by 7 cm. and weighing 290 gm. On cut section it was composed of solid, yellowish gray tissue with multiple scattered abscesses measuring 6 to 12 mm. in diameter and containing greenish purulent material. The attached tube measured 8 cm. in length and 2 cm. in its greatest diameter.

Microscopically, the tumor cells were fairly large with an abundance of acidophilic cytoplasm and deeply basophilic oval nuclei. They were arranged in irregular aggregates separated by thick septa of hyalinized connective tissue. In the septa there were numerous irregular, cleft-like spaces which contained tumor cells. A few pathologic mitotic figures were identified. Abscesses which contained cellular debris and large numbers of polymorphonuclear leukocytes were present within the tumor. At the periphery of the tumor there were two small follicle cysts surrounded by a small amount of normal ovarian stroma. Numerous zones of old hemorrhage were seen, as indicated by the presence of foam cells and cholesterol clefts within the tumor. Throughout most of the tumor there were infiltrations with large numbers of plasma cells and lymphocytes and moderate numbers of polymorphonuclear leukocytes. (Fig. 2.)

CASE III. A twenty-seven year old white married woman was admitted to St. Mary's Hospital, Enid, Oklahoma, complaining of lower abdominal pain of three months' duration. A large tumor of the left ovary was palpable on bimanual pelvic examination. A Friedman test was negative. Surgical exploration by Dr. F. M. Duffy revealed a left ovarian tumor measuring 15 cm. in diameter. The entire mass was removed.

The patient received no further therapy and two years following the removal of the tumor, re-entered St. Mary's Hospital with a mass in the upper abdomen and a solitary enlarged

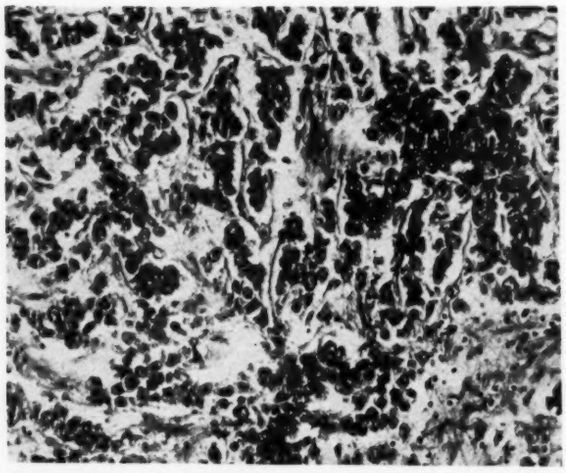

FIG. 3. Case III. Irregular arrangement of tumor cells with intercellular edema and early disintegration of nuclei. Hematoxylin and eosin stain, × 200.

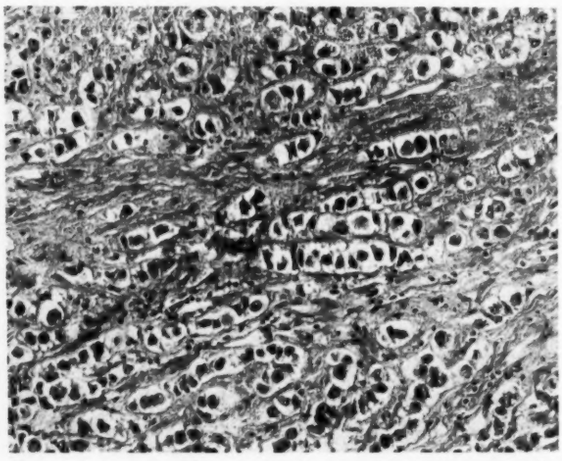

FIG. 4. Case III. Desmoplastic reaction in tumor cells with pyknosis of nuclei and increase in intercellular substance. Hematoxylin and eosin stain, × 150.

cervical lymph node. Surgical exploration of the abdomen was performed and tumor was observed in the perirenal and periaortic lymph nodes. The enlarged cervical lymph node was removed for biopsy. The patient expired a few weeks after dismissal from the hospital.

Pathologic report revealed that the specimen was a soft, light brown, oval mass of tissue measuring 6.5 by 3 by 1 cm.

Microscopically the individual cells comprising the tumor were large, round or polyhedral and the nucleus hyperchromatic. Pathologic mitotic figures were present in moderate numbers. There was variation in size and shape of individual cells presenting an anaplastic appearance. The connective tissue septa were thick and divided the tumor cells in numerous

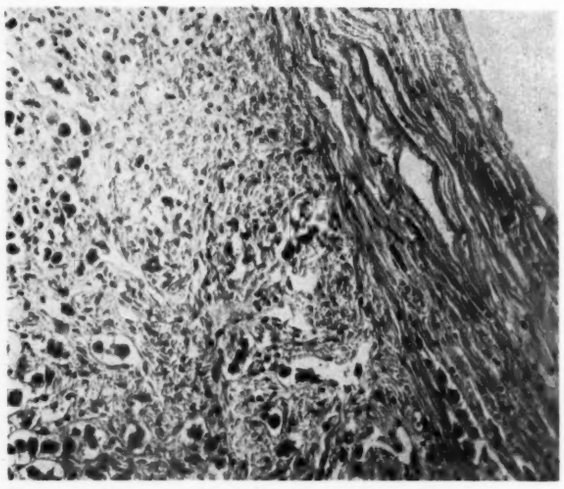

FIG. 5. Case III. Peripheral portion of tumor with fibroplasia. Hematoxylin and eosin stain, × 200.

small nests. There was considerable variation in the amount of connective tissue in various portions of the tumor. Occasional neoplastic giant cells were present in the zones of desmoplasia. The lymphoid stroma was prominent. (Figs. 3 to 5.)

Sections of the lymph node showed infiltration with the same type of tumor observed in the ovary. Relatively few fibrous septa were present in the metastasis and the tumor cells were distributed in a medullary pattern containing an abundance of lymphoid stroma. The capsule of the lymph node was destroyed and there was invasion of adjacent adipose tissue.

CASE IV. A seventeen year old single white girl was admitted to St. Francis Hospital in November, 1949, complaining of pain in the lower right quadrant and swelling of the abdomen. The enlargement was first noticed two months before admission and the mass rapidly increased in size. There had been amenorrhea for two months. A large, firm lower abdominal mass was easily palpable extending from the pelvis almost to the xiphoid process of the sternum. Friedman test was negative. Surgical exploration was performed by Dr. W. J. Bierman and a large mass was found entirely replacing the right ovary and a much smaller tumor in the left ovary. Bilateral oophorectomy was performed. Deep x-ray therapy was advised but refused by the patient. One year later the patient was admitted to a hospital in Fort Smith, Arkansas, because of a mass in the upper abdomen. She was operated upon by Dr. S. J. Hawkins and a

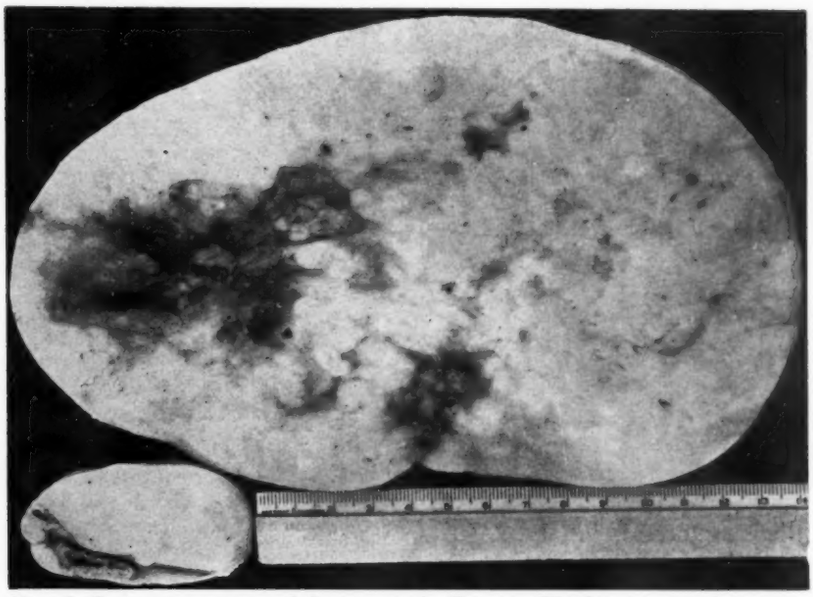

FIG. 6. Gross appearance of the tumors in Case IV. The large tumor has completely replaced the ovarian tissue and contains irregular zones of necrosis. The viable tumor tissue is homogeneous. The smaller tumor has not completely destroyed the ovarian tissue and a normal corpus luteum can be seen at the inferior margin.

large metastatic tumor was found in the liver and multiple implantations were present on the visceral and parietal peritoneum. Several pieces of tissue were removed for biopsy. The patient expired several weeks after the second operation.

Pathologic report revealed one ovarian tumor weighed 50 gm.; the other weighed 2,480 gm. The larger measured 12 by 20 by 23 cm. and had a glistening, grayish brown slightly lobulated surface. On cut section the specimen was made up of solid, grayish brown, firm tissue with many scattered zones of reddish brown discoloration. The small ovarian mass was 5 by 4.5 by 4.5 cm. and was similar in appearance on cut section. (Fig. 6.)

The majority of the ovary had been replaced by a solid mass of grayish brown tissue. Along one side there was a narrow band of normal appearing ovarian tissue containing a corpus luteum.

Microscopically, the nuclei were round to oval and hyperchromatic. There were frequently one or two nucleoli and moderate numbers of mitotic figures present. (Fig. 7.) At the periphery the tumor cells were arranged in elongated cords separated by fibrous septa. The lymphoid stroma was present. (Fig. 8.) In other zones the cells were in irregular masses separated by very small amounts of edematous connective tissue. (Fig. 9.) Within still other zones there was a desmoplastic reaction with proliferation of large amounts of fibrous connective tissue. A few small follicle cysts were present at one edge of the tumor.

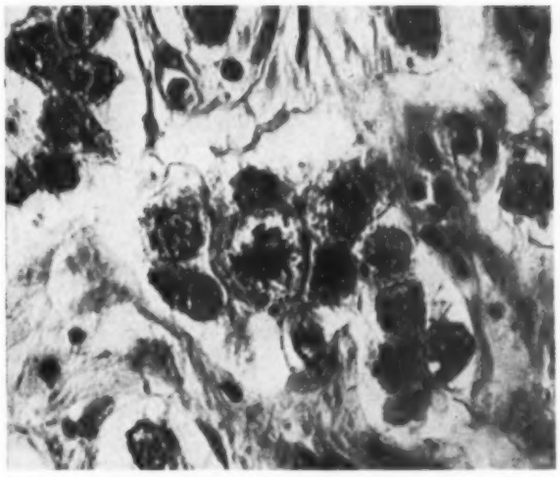

FIG. 7. Case IV. Pathologic mitotic figure in dysgerminoma. They are not present in large numbers but are more numerous in zones of medullary arrangement of tumor cells. Hematoxylin and eosin stain, × 480.

Sections of the metastatic omental lesion revealed essentially the same histologic appearance. The connective tissue septa were thin and the lymphoid stroma was prominent.

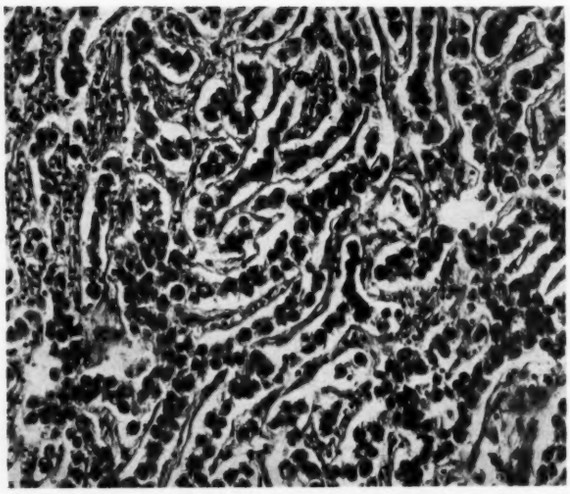

FIG. 8. Case IV. Typical appearance of dysgerminoma of the ovary. The monocellular pattern of the tumor with the abundant lymphoid stroma is apparent. The chromatin of the epithelial cells is vesiculated and little cytoplasm is present. Hematoxylin and eosin stain, × 200.

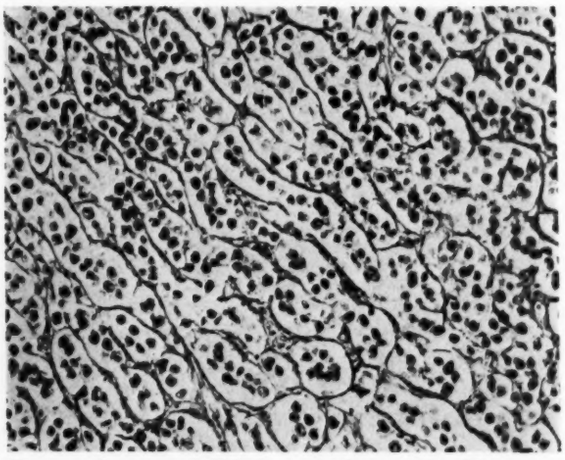

FIG. 9. Case IV. Wilder's reticulum stain. The supporting stroma contains an abundance of reticulum fibers. × 170.

CASE V. A sixteen year old white married girl consulted her physician because of inability to become pregnant. Bimanual pelvic examination revealed a large mass in the left adnexa. She was admitted to the Beaver Hospital, Beaver, Oklahoma, and operation was advised. Surgical exploration by Dr. Benjagardes revealed a tumor in the left ovary and a solitary nodule in the left broad ligament. A left salpingo-oophorectomy was performed. Recovery was uneventful and the patient subsequently became pregnant and delivered a normal term infant. One and a half years after operation the patient again consulted her physician complaining of left upper quadrant pain and weakness. An exploratory laparotomy was performed and a large retroperitoneal mass was found. The patient was then given radiation therapy and the mass decreased in size. The patient expired approximately two years after the original operation of generalized metastasis. Permission for autopsy was not obtained.

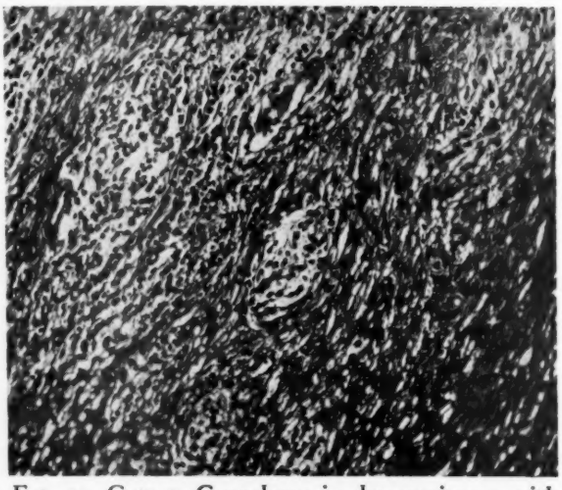

FIG. 10. Case V. Granuloma in dysgerminoma with giant cell formation. Hematoxylin and eosin stain, × 200.

Pathologic report revealed that the specimen consisted of an ovarian tumor weighing 286 gm. and measuring 11 by 8 by 6 cm. It was light yellowish brown and firm in consistency. The cut surface was homogeneous and a light grayish brown. There was a smaller nodule 1 cm. in diameter within the broad ligament which had a similar appearance on cut section.

Microscopically, the tumor cells were arranged in long cords and irregular nests. The cells were large and polyhedral. Large numbers of mitotic figures were present. Many of the nuclei contained one or two prominent nucleoli. The fibrous septa were thick and the lymphoid stroma prominent. In some zones there were large amounts of connective tissue which was quite cellular in appearance.

PATHOLOGIC ANATOMY

The gross appearance of dysgerminoma of the ovary is quite characteristic. The tumors are surrounded by a dense capsule of fibrous connective tissue which is usually smooth but occasionally contains coarse nodules. The cut surface is grayish yellow, firm and has a "rubbery" consistency. Zones of necrosis and

hemorrhage are frequently encountered. Only one ovary is usually involved. Four of the five cases in this series were unilateral and only nineteen of 162 cases previously reported were bilateral.

The five cases presented show a varied but typical microscopic appearance of dysgerminoma of the ovary. The cells are arranged in alveolar nests and cords separated by septa of fibrous connective tissue. The lymphoid stroma, consisting of focal and diffuse collections of lymphocytes, is a conspicuous part of the tumor. The nuclei are large, round to oval and rather deeply basophilic. The chromatin tends to be vesiculated and concentrated at the periphery of the nuclei. The cytoplasm is abundant, faintly acidophilic and well defined. Mitotic figures can usually be identified but are not frequently seen. The arrangement of the neoplastic cells varies within different tumors and within various zones of the same tumor. In some regions they are arranged in nests and cords separated by septa of connective tissue while in others there is an advanced desmoplastic reaction with only scattered cords of tumor cells embedded within a dense fibrous matrix. Many of the tumors are very cellular and contain only small amounts of connective tissue. In those containing a more medullary pattern there are zones of necrosis and abscess formation. At the periphery of the necrotic zones there are occasional multinucleated cells resembling foreign body giant cells. Schiller[4] suggested the morphologic similarity of the multinucleated cells to the Langhans' type of giant cells. (Fig. 10.) This was not concurred in after study of our cases and is analogous to the reaction seen in seminoma of the testis. Although they were frequently found in or around necrotic zones, the cells were thought to be a specific reaction to the necrotic neoplastic tissue. Novak[5] called these cells "symplasmic giant cells" and believes they are the result of degenerative changes with merging of tumor cells and formation of large polymorphonuclear masses. Several of the tumors in this series were quite cellular and contained only scattered fibrous septa. There is apparently no correlation between the degree of cellularity or anaplasia and the local invasive capabilities, although the more cellular tumors quickly produced distant metastasis.

The two metastatic lesions from which tissue was obtained were similar in appearance to the primary tumors. All of the five cases were "pure" dysgerminomas, for microscopic examination of multiple sections of the five tumors and the two metastatic lesions failed to reveal the presence of any other cell types.

Dysgerminomas characteristically spread by direct extension or by invasion of lymphatic channels. Several reported cases with widespread metastasis including heart, lung, thyroid and several other organs, indicate that in some instances invasion of blood vessels must occur.

COMMENTS

Dysgerminoma of the ovary has long aroused considerable speculation concerning the cellular origin. The dysgerminoma occupies a unique position in tumors of the female gonad in that it has a histologically similar counterpart, the seminoma, in the male gonad. In view of this analogy the most widely accepted theory of histogenesis is that of Robert Meyer,[1] who proposed the concept that the dysgerminoma arose from a sexually undifferentiated stage of gonadal development. Meyer also stated that these cells were not capable of differentiating into the male or female types. The neuter character of the tumors is further supported by the lack of hormonal activity.[5] The occasional occurrence of dysgerminomas containing choriocarcinoma or teratomatous elements is not adequately explained by Meyer's theory, unless one assumes that they represent mixed tumors of the "collision" type. This implies that they are actually two separate tumors arising from different cells of origin. This explanation seems unlikely.

If the Friedman test is positive, one should expect to find choriocarcinomatous elements within the tumor. Selye[6] states that dysgerminoma may produce an increase in the urinary excretion of gonadotropins. However, there does not appear to be sufficient evidence to support this statement. Furthermore, Pedowitz and Grayzel[3] report a case of dysgerminoma in which the metastatic lesions contained choriocarcinomatous elements despite the fact that choriocarcinoma could not be demonstrated in the primary tumor. In this case the Aschheim-Zondek test was positive in high dilutions at the time of removal of the primary tumor. Friedman and Moore[7] noted a similar occurrence in embryonal carcinoma of

the testis which they believe arises from totipotential cells. However these authors encountered fully differentiated choriocarcinoma in 6 per cent of the embryonal carcinomas and in their classificarion, included choriocarcinoma of the testis as a type of embryonal carcinoma. Burge[2] reported two cases of dysgerminoma of the ovary associated with positive Aschheim-Zondek test despite the absence of gestation or choriocarcinoma. Since the usual large size of the tumors renders serial sections a practical impossibility it is possible that these cases represent dysgerminomas containing small foci of trophoblastic elements which were not demonstrated.

The occasional occurrence of choriocarcinoma within dysgerminoma of the ovary leads to the conclusion that the cell of origin must be totipotential. Babes,[8] Reifferschneid[9] and Schiller[10] have each reported cases of mixed tumors composed of dysgerminoma and granulosa cells. Furthermore, Meckler and Black[11] have reported a case of gynandroblastoma containing both arrhenoblastic and granulosa cell elements. These instances of mixed types of neoplasms lend further support to the view that the cell of origin is a totipotent cell of the primitive gonadal mesenchyme capable of differentiating in any direction. If the development and growth of the tumor in the female is along neuter lines, a monocellular dysgerminoma results; or if the analogous tumor develops in the male, the tumor is a seminoma.

The totipotent cell may also differentiate along either male or female lines. If the former occurs, the resulting tumor is an arrhenoblastoma, or if the latter, a feminizing mesenchynoma is produced. The totipotent cell is also capable of producing a tumor which may differentiate to a choriocarcinoma or teratoma.

If this idea is carried further, one must accept the fact that numerous other mixed tumors are theoretically possible. It seems most probable that the tumors arise from a totipotent cell of the undifferentiated gonadal mesenchyme or a primitive germ cell. The germ cell is potentially capable of differentiating in any of four different ways: (1) By maturation into a stromal type of cell it may produce one of the feminizing mesenchymomas of the ovary. The resulting tumor might be a granulosa cell tumor, thecoma or a combination of the two cell types. (2) The germ cell may differentiate along masculine lines and produce an arrhenoblastoma. (3) If the germ cell differentiates along neuter lines, a dysgerminoma is produced. (4) The germ cell may realize all its totitpotentialities and develop as a teratoma. The teratoma may in turn give rise to a choricarcinoma, arrhenoblastoma, dysgerminoma, one of the feminizing mesenchynmomas, or a mixture of these tumors. The teratoma contains cells identical with, or similar to the primitive germ cell and are capable of reproducing a great variety of cell types and structures.

We believe that the mixed tumors of the ovary containing a combination of cellular elements such as dysgerminoma and choriocarcinoma, or granulosa cell tumor and dysgerminoma should be identified as mixed tumors with indication of the principle cell type as the clinical evolution and prognosis will vary with the type of cell which ultimately predominates. Only those monocellular tumors developing along "pure" neuter cell lines should be classified as dysgerminoma.

There is no specific clinical syndrome associated with dysgerminoma of the ovary. The most common complaints are lower abdominal pain and the presence of an abdominal tumor. In two of our cases the mass was sufficiently large to be felt on abdominal examination. None of the patients experienced any abnormal vaginal bleeding, although such a finding has been occasionally reported. One of the patients had amenorrhea for two months and the tumor was found to be bilateral with only a narrow rim of ovarian tissue remaining. Since the dysgerminoma is a non-functioning tumor, one would not expect any deviation of menses except for those changes produced by replacement of ovarian tissue. One of the patients (Case v) consulted her physician because of inability to become pregnant. It is interesting that this same patient conceived and delivered a normal infant between the time of removal of the unilateral dysgerminoma and death from metastasis two years later. Infertility is not usually a presenting complaint unless the tumor is replacing enough normal ovarian tissue to interfere with ovulation. Of the 427 reported cases, eleven were first recognized during pregnancy.

A Friedman test for pregnancy was done in three of our five patients and was negative in each instance which is in keeping with the histogenesis and classification of dysgermi-

noma. If the tumor contains functional cells capable of producing gonadotropins, then it should be classified other than dysgerminoma. The Friedman test is only of negative value in establishing a preoperative diagnosis.

Pseudohermaphrodism was not manifest in any of our five patients and no abnormalities of the external genitalia were present. Meyer[1] reported that pseudohermaphrodism was occasionally found in association with this tumor. It is probable that this association is related to replacement of ovarian tissue by the tumor and not to any functional hormone activity of the neoplasm.

Dysgerminoma occurs most frequently before the age of thirty years. Mueller[12] in an analysis of 427 cases reported that 72 per cent of these tumors have occurred in the second and third decades of life. All five of our cases fall into this group, the oldest being twenty-seven, the youngest sixteen years.

From the aforementioned it is obvious that the final diagnosis cannot be made with accuracy until the time of surgical exploration. However, much information excluding other diagnoses can be obtained preoperatively.

A critical analysis of our cases and of those previously reported establish the highly malignant potentialities of dysgerminoma. The treatment in the majority of instances consisting of removal of the tumor is entirely inadequate. The tumor occurs most commonly in the younger age group and because of isolated case reports of prolonged survival with conservative surgical therapy, physicians have been reluctant to institute radical measures. However, it should be emphasized that four of the five cases in this series died within two years of operation and all were treated by conservative surgery consisting of unilateral or bilateral oophorectomy. (Table 1.) Although five cases are not statistically significant, the death of four of the five patients within two years of operation certainly indicates that this is a highly malignant tumor. In view of the proven malignancy of dysgerminoma we believe that radical surgery should be performed.

It has been well established that dysgerminoma is susceptible to deep roentgen therapy as is its counterpart in the male the seminoma.[13] Following surgical extirpation radiation therapy should be given and a full tumor dose administered. It is believed that the proven high degree of malignancy of dysgerminoma justifies a radical approach to tumors of this type even though occurring in the younger age group. Conservative surgery followed by roentgen therapy seems inconsistent as the radiation will nullify the purpose of conservative surgery which is the preservation of the child-bearing function.

TABLE 1

Case No.	Operation	Follow up
I	Unilateral oophorectomy	Expired 2 mo.
II	Unilateral salpingo-oophorectomy	Alive and well 4 yr.
III	Unilateral oophorectomy	Expired 2 yr.
IV	Bilateral oophorectomy	Expired 1 yr.
V	Unilateral salpingo-oophorectomy	Expired 2 yr.

A similar plea for radical therapeutic measures has been made by Pedowitz and Grayzel[3] who analyzed seventeen cases of dysgerminoma of the ovary. Twelve of the patients died within four years with a resulting five-year survival in their series of 12.5 per cent. These authors also believe that x-ray therapy should follow radical surgical removal of the tumor, uterus, tubes and ovaries.

If the survival rate of patients with dysgerminoma of the ovary is to be improved, it appears that more radical surgical procedures must be utilized and subsequent roentgen ray therapy given. Analysis of the material presented justifies these procedures.

SUMMARY AND CONCLUSIONS

1. Five cases of dysgerminoma of the ovary are presented with a four-year survival rate of 20 per cent following conservative treatment.
2. The histogenesis and classification of solid ovarian tumors are discussed and a new concept proposed.
3. The clinical findings are presented emphasizing the frequent occurrence of this tumor in the young age group.
4. The anatomic and clinical features establishing dysgerminoma of the ovary as a highly malignant tumor are described.
5. The treatment of choice is radical surgery and postoperative roentgen therapy.

REFERENCES

1. MEYER, R. The pathology of some special ovarian tumors and their relation to sex characteristics. *Am. J. Obst. & Gynec.*, 22: 697, 1931.
2. BURGE, E. S. Dysgerminoma of the ovary. *Am. J. Obst. & Gynec.*, 57: 1014, 1949.
3. PEDOWITZ, P. and GRAYZEL, D. M. Dysgerminoma of the ovary. *Am. J. Obst. & Gynec.*, 61: 1243, 1951.
4. SCHILLER, W. Disgerminom und Tuberkulose. *Arcb. f. Gynäk.*, 156: 513, 1934.
5. NOVAK, E. Gynecological and Obstetrical Pathology, p. 290. Philadelphia, 1947. W. B. Saunders Co.
6. SELYE, H. Textbook of Endocrinology, 2nd ed., p. 449. Montreal, Canada, 1949. Acta Endocrinologies Inc.
7. FRIEDMAN, N. B. and MOORE, R. A. Tumors of the testis. *Mil. Surgeon*, 99: 573, 1946.
8. BABES, A. Über die von Robert Meyer als "eiene besondere Form von Carcinom bei Zwittern und scheinbar nicht zwittrigen Menschen beiderlei Geschlects" Tumoren. *Arcb. f. Gynäk.*, 135: 545, 1929.
9. REIFFERSCHNEID, W. Über sieben neue Fälle von "Disgerminoma ovarii" (R. Meyer) davon einen mit kleinen Elnschlüssen von folliculoiden Bildungen. *Ztscbr. f. Geburtsb. u. Gynäk.*, 110: 273, 1935.
10. SCHILLER, W. Disgerminome des Myometriums. *Arcb. f. Gynäk.*, 158: 76, 1934.
11. MECKLER, E. A. and BLACK, M. C. Gynandroblastoma of the ovary. *Am. J. Patb.*, 19: 633, 1943.
12. MUELLER, C. W., TOPKINS, P. and LAPP, W. A. Dysgerminoma of the ovary. *Am. J. Obst. & Gynec.*, 60: 153, 1950.
13. ACKERMAN, L. V. and DEL REGATO, J. A. Cancer, Its Diagnosis and Treatment, p. 821. St. Louis, 1947. C. V. Mosby Co.

THE following words are found in Sir Thomas Browne's "Religio Medici" penned three centuries ago:

"Search while thou wilt, and let thy Reason go,
To ransome Truth, even to th' Abyss below;
Rally the scattered Causes, and that line
Which Nature twists, be able to untwine."

INTESTINAL OBSTRUCTION IN ADVANCED OVARIAN CARCINOMA*

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INTESTINAL obstruction has figured prominently in the palliative management of advanced ovarian cancer. We present our experience with this complication of the disease seen during the past five years. This study is based on 125 pathologically confirmed cases. The management of these patients was the combined effort of the surgical and neoplastic services.

Ovarian carcinoma remains one of the most silent of all intraperitoneal tumors. Many cases present advanced disease when first seen as evidenced by ascites, fixed pelvic masses and signs of peritoneal or pleural carcinomatosis. These patients are beyond the possibility of curative excisional therapy. In this review the term advanced carcinoma is used to designate those cases in which the disease has already extended beyond the confines of the adnexa. Since curative measures could not be undertaken the therapeutic efforts were directed at symptomatic palliation. It was in this that intestinal obstructive problems presented themselves. We have been unable to find a published experience with this problem.

The diagnosis of intestinal obstruction has been made on the basis of clinical symptomatology, x-ray study, operative findings or postmortem examination. Satisfactory criteria in two of these diagnostic spheres had to be present in order to include the case in the obstructive category. By these criteria intestinal obstruction was present in fifty-seven (45.6 per cent) of the 125 cases reviewed. (Table 1.)

It is possible to divide the fifty-seven (group II) patients with obstruction into two groups. Thirty-four patients, or 27.3 per cent, (group II A) presented symptoms and signs of obstruction, and these symptoms constituted a major factor in the discomfort which we endeavored to palliate. However, twenty-three patients, or 18.4 per cent, (group II B) presented signs of obstruction but insignificant symptoms, so that although intestinal obstructions of varying degrees of incompleteness were present, there was no problem of symptomatic therapy. We characterize this group as presenting occult intestinal obstruction.

TABLE 1
INCIDENCE OF INTESTINAL OBSTRUCTION

Type	No. of Cases	Per cent of Cases
Group I (unobstructed)	68	54.4
Group II (obstructed)	57	45.6
Total	125	100.0

Thus although obstruction was present in 45.6 per cent of the patients with advanced ovarian cancer, only 27.3 per cent presented symptoms for therapeutic consideration. Therefore, approximately one of each four patients falls into the group suggesting palliation for intestinal obstruction.

CLINICAL FINDINGS

The clinical picture presented by patients in group II is characterized by abdominal discomfort, back pain, ascites, gaseous abdominal distention, anemia, azotemia and hypoproteinemia associated with easily palpable abdominal and pelvic masses. The group II B patients also presented intermittent episodes of nausea, vomiting, crampy abdominal pain and varying degrees of constipation and rectal tenesmus. Intestinal intubation usually relieves these patients only temporarily. It has been repeatedly noted that the obstruction is intermittent and partial. Symptomatic recurrence and relief seem to be more a matter of the natural course of the disease than response to intubation. The intermittent and recurrent

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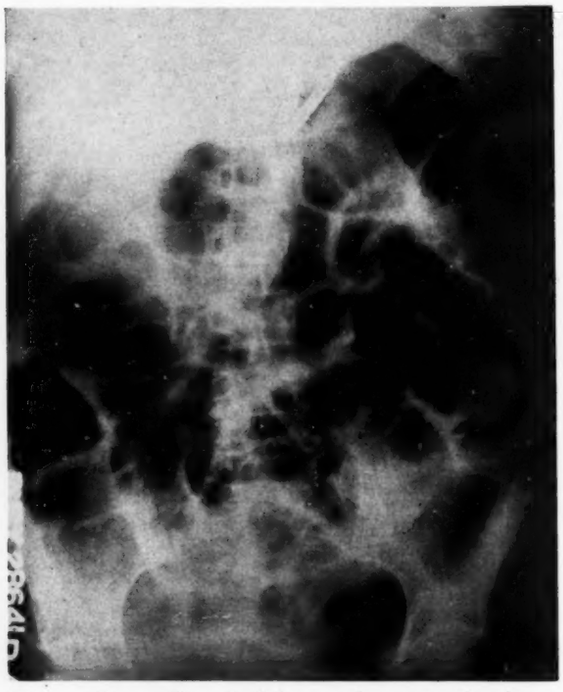


FIG. 1. Scout film of abdomen demonstrating large and small bowel dilatation in a patient with symptomatic recurrent episodes of intestinal obstruction.

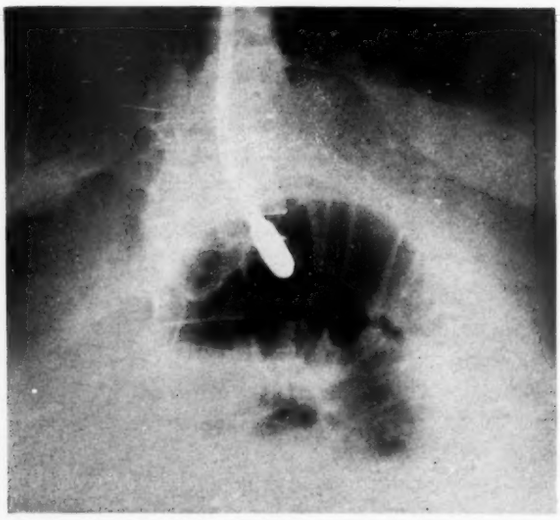


FIG. 2. Radiograph of abdomen demonstrating high small intestinal obstruction. Note dilated jejunal loops. This patient was asymptomatic.

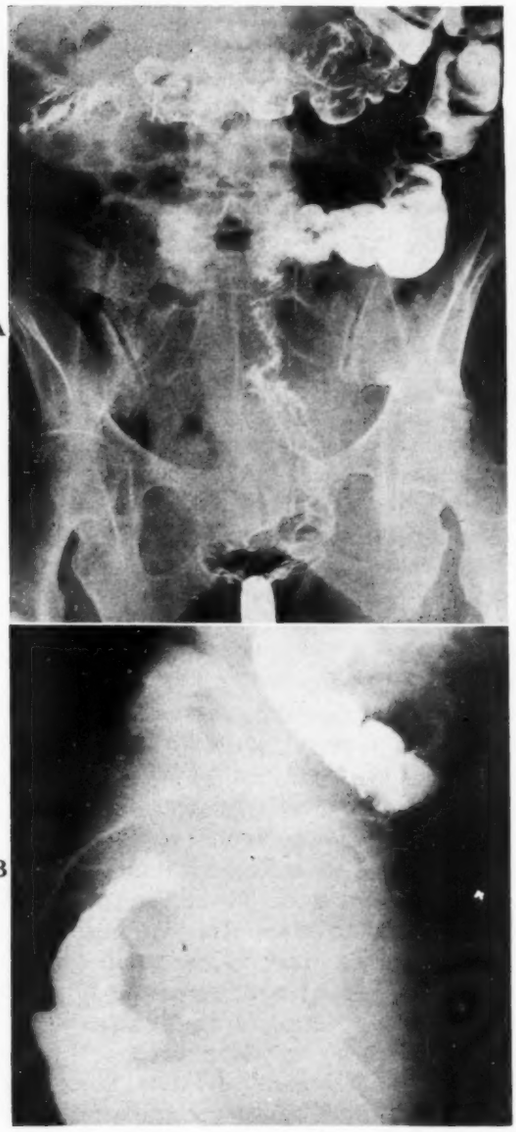
nature of the obstruction may be influenced by patterns of fluid balance, serum protein levels and the degree of intestinal distortion produced by the varying relations between ascitic fluid and intraperitoneal masses. There has been no reliable correlation between the extent of intra-abdominal metastases and the appearance of obstructive symptomatology. Several features in the physical examination of these patients deserve special comment.

Abdominal Examination. There is marked abdominal distention due to ascitic fluid, gaseous intestinal dilatation and intra-abdominal masses. These patients may exhibit evidence of marked weight loss, with hollowed facies. The marked abdominal distention gives them the appearance of being "almost all abdomen." Frequently there is evidence of radiation pigmentary changes in the skin. Small bowel peristaltic waves can often be demonstrated.

Rectovaginal Examination. These findings are characteristic. Rectal sphincter tone is decreased. Tenderness is marked. The cul-de-sac contains masses of various sizes that extend laterally and superiorly beyond the true pelvis. It is usually not possible to outline any of the pelvic viscera. There is a stenosis of the rectum through which it is not possible to pass the tip of the examining finger. This is caused by the posterior extension of the cul-de-sac mass on to the anterior wall of the rectum. The rectal mucosa is edematous but usually intact. The continuity that exists between the pelvic mass and its extra mucosal rectal extension and intrusion is usually quite obvious.

Sigmoidoscopy. It is usually not possible to pass the sigmoidoscope more than four inches beyond the anal sphincter because of angulation. The rectal lumen is usually compressed in an anteroposterior direction. The mucosa is edematous and congested but usually not ulcerated. The site of stricture appears abruptly and does not present as a gradual conical area in narrowing. In none of these cases has a biopsy of the stricture site revealed carcinoma.

X-ray. During the phase of symptomatic obstruction scout films of the abdomen show large and small bowel distention. (Fig. 1.) Some of the films have shown a complete large bowel obstruction at the rectum or sigmoid with multiple fluid levels in the upper small intestine. This phenomenon is not related to an incomplete ileocecal valve, but rather to multiple sites of obstruction. Other flat films have shown localized high small intestinal obstruction. (Fig. 2.) We have refrained in the great majority of cases from doing small intestinal studies with barium because of the danger of converting a partial obstruction into a complete one. Where these studies have been done, the roentgenograms demonstrate twisting,



3A

3B

FIG. 3. Postero-anterior (A) lateral and (B) barium enema studies of the pelvic colon demonstrating a long segment of narrowing with preservation of mucosal pattern. Postero-anterior view also shows contour deformity of rectosigmoid colon distal to stricture. This patient was asymptomatic.

kinking and displacement of small intestinal loops with multiple sites of narrowing. Barium enema studies have shown varying degrees of pelvic colon stenosis usually extending several inches in length. In those cases in which barium passed beyond the stricture the mucosa of the narrowed segment is demonstrably intact. (Fig. 3A and B.) The proximal colon is dilated but not markedly so. In some cases the stenosis could not be passed and it was possible

FIG. 4. Barium enema study of large bowel showing multiple sites of colonic stricture. These strictures were all extramucosal. Patient was asymptomatic.

to show only complete obstruction. Extra mucosal masses can frequently be visualized directly as soft tissue densities or indirectly by the contour defects that they produce on neighboring organs. In a few cases multiple areas of extra mucosal colon strictures can be shown. (Fig. 4.) The roentgen studies, therefore, show multiple large and small intestinal sites of luminal narrowing of varying degrees of completeness.

EVALUATION OF RESULTS

The twenty-three patients in group II B whose course was characterized by occult intestinal obstruction lived an average of 11.5 months from the time of diagnosis of carcinoma and 3.5 months from the time that a diagnosis of intestinal obstruction was made. There were thirty-four patients in group II A who presented symptomatic intestinal obstruction; in eighteen of these patients no operative procedure for the treatment of symptomatic obstruction was undertaken. The duration of life in these patients from the time of diagnosis of carcinoma was 11.2 months and 3.2 months from the diagnosis of intestinal obstruction.

The duration of life in patients with advanced ovarian carcinoma who present intestinal

obstruction does not vary appreciably in relation to the presence or absence of the symptoms of intestinal obstruction.

The remaining sixteen patients in group II A were operated upon in the presence of advanced peritoneal carcinomatosis in an effort to palliate the symptomatic obstruction. Four of these patients died within the first postoperative week, an immediate postoperative mortality of 25 per cent.

TABLE II
SURVIVAL FOLLOWING OPERATIVE PROCEDURE

	No. of Cases	Survival in Months*	Post-operative Deaths
Operative decompression..	13	2.5	3
No decompression.....	3	3.5	1
Total.....	16	3.0	4

* Postoperative deaths not included in survival rate.

In three patients a laparotomy was performed, but their intra-abdominal situation seemed so hopeless that surgical decompression was not attempted. In the remaining thirteen patients there were ten colostomies, one ileocolostomy and two ileotransverse colostomies with simultaneous sigmoid colostomy. The ten patients who survived the procedure and in whom a vent was made lived an average of 2.5 months. The two patients who survived laparotomy without a vent being made lived 3.5 months. (Table II.)

Although the vent functioned in all cases, these patients continued to complain of abdominal cramps, vomiting and intermittent distention. Small bowel fistulas developed in two patients following operation and a recto-vaginal fistula developed in a third patient following colostomy. Thus there was no alleviation of symptoms, and complications occurred in spite of operative decompression. The duration of life in those patients who survived was actually shortened by 0.7 months when compared to those symptomatically obstructed not operated upon.

PATHOLOGY

We have reviewed the autopsy findings to determine the mechanisms of obstruction and the reasons for the failure of surgical decompression. The autopsy findings in relation to the gastrointestinal tract are uniformly similar and present a distinct pattern. The recurrent or residual cancer involves all of the pelvic viscera; the sigmoid, adnexa, uterus, bladder and frequently cecum and terminal ileum are indistinguishably "baked in" by tumor. Even at autopsy it is difficult to distinguish and separate the lower abdominal organs. The pelvic colon is the most markedly affected portion of the gastrointestinal tract. The lumen is angulated posteriorly and compressed in an anteroposterior direction by the cul-de-sac. The colonic wall is invaded by tumor but the mucosa is usually spared. In some cases the pelvic colon is completely encircled by the extramucosal tumor. In addition to tumor invasion the colonic wall shows areas of edema, congestion and inflammation. Because of its mobility the transverse colon is angulated and displaced by the intra-abdominal masses; it may be adherent to the anterior abdominal wall by tumor tissue.

The small intestine shows numerous serosal implants; some of these bulge submucosally into the lumen. The most significant change in the small intestine is the extensive matting, kinking, twisting, angulation and luminal distortion which is produced by tumor implants that are adherent to each other, to the abdominal wall and to the intraperitoneal tumor masses. The mesentery of the small bowel is thickened and shortened by tumor implants. This results in multiple areas of partial small bowel obstruction occurring even as high as 15 cm. from the ligament of Treitz. Since there are multiple sites of both large and small bowel obstruction of varying degrees of completeness effective surgical decompression is a mechanically impossible procedure.

SUMMARY AND CONCLUSIONS

1. Of 125 patients with advanced ovarian cancer 45.6 per cent had intestinal obstruction. The obstruction was symptomatic in 27.3 per cent.

2. The intestinal obstructions occur at multiple levels, involve large and small intestine, and are of varying degrees of completeness.

3. The duration of life in patients with obstructions who were not operated upon from the time of diagnosis of carcinoma was 11.2 months for the symptomatic group and 11.5 months for the occult group. The survival from

onset of obstruction was 3.5 months in the symptomatic group and 3.2 months in the asymptomatic group.

4. Surgical by-pass operations were associated with a 25 per cent mortality. The remaining patients lived an average of 3.0 months. In the survivors there was no effective symptomatic palliation or security from complications.

5. The course of this disease is such that surgical decompression of the obstructed intestinal tract is not mechanically possible.

Acknowledgement. We wish to express our gratitude to Dr. Daniel Laszlo for his cooperation and advice. We are indebted to Dr. Harry Zimmerman for access to pathologic material and to Dr. Joel Schwartzman for the roentgenograms.

STUDIES by H. B. Benjamin on the neurovascular mechanism of the gastric mucosa confirm the impression of others that ulcers are predisposed to occur on the basis of localized anemia. Benjamin studied the vascular pattern of the gastric mucosa in unstimulated and stimulated stomachs by means of microradiography and microphotography. Normally the gastric mucosa is richly supplied not only by the larger vessels but also by densely interanastomosing smaller vessels. When the cut end of the right vagus nerve is stimulated, however, Benjamin found that while the main vessels still stand out in the pyloric portion of the mucosa, the smaller vessels are not discernible and the blood is shunted through other small vessels in the periphery of this area which show up like steps in a ladder. Thus a localized portion of the pyloric mucosa is rendered anemic. The author logically concludes, therefore, that neurovascular imbalance produces localized anemia through this shunting process and that this may lead to ulcer formation. (*Richard A. Leonardo, M.D.*)

SURGICAL INDICATIONS IN MASSIVE HEMORRHAGE FROM PEPTIC ULCERATIONS*

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HEMORRHAGE is the most frequent major complication of peptic ulcerations of the stomach and duodenum and, with the possible exception of acute perforations, remains as the most frequent cause of death in this disease complex. In relation to the over-all figure of peptic ulcer the percentage mortality resulting from hemorrhage is low, our own incidence being 3.1 per cent. However, deaths from hemorrhage are usually reported as the percentage within the group known as massive hemorrhage and a review of the reported statistics reveals an incidence ranging between 2.5 per cent and 40 per cent.[11–14] Our incidence is 20 per cent. So wide a variation indicates a rather obvious lack of uniformity as to the criteria of massive hemorrhage and has led to an unfortunate and persistent controversy between the various proponents of the medical and surgical forms of therapy. A careful study of this and other reported series reveals such comparisons to be purely artificial, there being no logical, uniform basis for comparison between medically and surgically treated groups, provided that the term massive hemorrhage is accurately defined and its use restricted to a very definite clinical entity.

The term massive hemorrhage implies a profuse and rapidly progressive blood loss sufficient to produce the usual clinical criteria of hemorrhagic shock including weakness, fainting, ashen pallor, cold sweat, a blood pressure below 100 systolic, rapid, thready pulse, red blood count below 3,000,000 with hemoglobin of 60 per cent or lower. It is nearly always associated with hematemesis which is a much more serious symptom than melena and usually indicates an exsanguinating type of hemorrhage. It should be clear that red blood cell counts below 3,000,000 with a hemoglobin of 50 per cent or lower may be present as a result of periodic, slow hemorrhage existing over a long period of time. This in no wise represents a massive, rapid hemorrhage with its attendant immediate danger of death. Nor must all of the above criteria be present in order to predicate a state of hemorrhagic shock. They are all usually present and the clinical picture of weakness, dizziness or fainting associated with an ashen pallor is basic to the diagnosis of shock. However, the accompanying compensatory vasospastic phenomena are occasionally sufficient to maintain, temporarily, a normal or even elevated blood pressure in the face of severe hemorrhage when all other criteria of shock are present. This is a doubly dangerous situation resulting, as it often does, in a false sense of security with inadequate or no replacement therapy. For when the pressure finally does fall, the blood volume will have reached its extreme lower limit. The particular relationship of this phenomenon to the problem under discussion will be developed later in this report.

Bleeding of greater or lesser degree is a relatively common occurrence in peptic ulcerations. Approximately 20 per cent of ulcers bleed to some extent at one time or another during their life history. Holman[11] in an extensive series reported it as a presenting symptom in 25 per cent of hospital admissions for peptic ulcer. Our own series reveals a somewhat higher incidence. Of 127 admissions for peptic ulcer covering a period of two years, seventy-three or 57 per cent had bleeding as one of the presenting symptoms. However, massive hemorrhage, as defined above, is another matter and only twenty cases could fulfill the criteria laid down for this designation. (Table I.) This is 15 per cent of the total or 27 per cent of those admitted with hemorrhage. (Table II.)

There are few therapeutic problems more perplexing or more taxing to the powers of decision than the management of this sudden

* From the Surgical Service of the Beth David Hospital, New York, N. Y.

TABLE I

DETAILED DATA OF TWENTY CASES OF MASSIVE GASTROINTESTINAL HEMORRHAGE

Patients	No. of Case	Sex and Age	Diagnosis	Length of History	Previous Hemorrhage	Type of Bleeding	Immediate History	Appearance of Patient	Admission Blood Pressure and Pulse	Red Blood Cells and Hemoglobin	Course in Hospital	Amount of Blood Replacement (cc.)	Therapy	Findings (Autopsy or Operation)	Result
R. M.	50–4122	M, 43	Stomal ulcer	10 yr.; 2 yr. postresection	1	Hematemesis	Fainted, weakness	Pale, sweating	120/90 180	2,600,000 58%	6 episodes of hematemesis and shock in 4 days	9,500	Conservative	None	Recovery
C. O.	51–359	M, 44	Gastric ulcer	21 yr.	1	Hematemesis, melena	Syncope	Pale and cool	90/60 100	3,400,000 67%	1 recurrent episode of hematemesis and shock	3,600	Surgery	Gastric ulcer	Recovery
G. B.	50–1433	M, 40	Duodenal ulcer	12 yr.	None	Hematemesis, melena	Weakness, fatigue, vertigo	Pale, cool, clammy	80/60 120	4,400,000	Continuous bleeding and shock	2,000	Conservative	No autopsy	Death
M. J.	51–5566	F, 50	Duodenal ulcer	1½ yr.	1	Hematemesis, melena	Syncope	Weak, pale	120/70 106	2,100,000 32%	3 recurrent hemorrhages	4,500	Conservative	Duodenal ulcer	Death
T. K.	51–246	M, 49	Duodenal ulcer	None	None	Hematemesis, melena	Vertigo, syncope	Pale, weak	106/64 104	3,000,000 49%	1 recurrent episode of melena and shock	4,500	Conservative	None	Recovery
A. C.	51–5405	M, 64	Gastric ulcer	45 yr.	None	Hematemesis, melena	Syncope	Pale, weak	100/60 78	3,300,000 62%	Stopped bleeding; elective surgery	3,000	Conservative	Prepyloric gastric ulcer with penetration	Recovery
L. C.	50–2825	F, 45	Duodenal ulcer	6 mo.	None	Hematemesis	Syncope	Pale, cool	80/60 72	1,300,000 Less than 25%	Stopped bleeding	4,500	Conservative	None	Recovery
J. E.	50–1979	M, 38	Duodenal ulcer	20 yr.	None	Hematemesis, melena	Epigastric pain	Pale	95/70 88	3,600,000 71%	Stopped bleeding	1,000	Conservative	None	Recovery
J. B.	50–5781	M, 32	Duodenal ulcer	7 yr.	4	Hematemesis, melena	Vertigo, weakness	Sweating, pale	80/60 120	3,000,000 67%	Stopped bleeding	3,500	Conservative	None	Recovery
R. B.	51–23	F, 57	Duodenal ulcer	7 yr.	None	Hematemesis	Vertigo, weakness	Pale	126/84 130	2,500,000 52%	2 recurrent episodes of hematemesis and shock	4,500	Surgery	Chronic hyperplastic gastritis and duodenal ulcer	Recovery
M. G.	51–516	F, 46	Duodenal ulcer	5 yr.	7	Hematemesis	Syncope, weakness, dyspnea	Pale, dry mouth and dry skin	60/0 130	3,200,000 40%	Stopped bleeding	7,000	Conservative	Duodenal ulcer	Recovery
F. C.	51–2887	M, 67	Duodenal ulcer	6 wk.	3	Hematemesis	Hematemesis	Pale	160/110 82	4,500,000 86%	2 recurrent episodes of hematemesis and shock	0	Conservative	None	Death
P. K.	50–5098	M, 36	Duodenal ulcer	7 yr.	None	Hematemesis	Weakness	Pale	105/60 110	4,040,000 77%	Stopped bleeding	2,500	Conservative	None	Recovery
S. F.	51–5486	F, 22	Acute erosion	3 yr.	None	Hematemesis	Weakness	Pale, dehydrated	90/60 120	3,100,000 62%	3 recurrent episodes of hematemesis and shock	9,000	Surgery	Hypertrophic gastritis and multiple prepyloric erosions	Recovery
J. D.	51–5625	M, 46	Gastric ulcer	12 yr.	None	Hematemesis, melena	Dyspnea, weakness	Cold, clammy	80/0 120	3,000,000 65%	Stopped bleeding	3,000	Conservative	None	Recovery
A. M.	51–4278	M, 27	Duodenal ulcer	11 mo.	2	Hematemesis	Hematemesis, weakness	Pale	90/40 100	3,100,000 55%	Stopped bleeding	3,000	Conservative	Penetrating duodenal ulcer	Recovery
J. C.	50–4575	M, 59	Duodenal ulcer	20 yr.	None	Hematemesis, melena	Syncope, epigastric pain, vertigo	Cold, clammy, pale	80/50 108	1,900,000 55%	Stopped bleeding	3,000	Conservative	Anterior duodenal ulcer	Recovery
J. G.	51–4059	M, 44	Stomal ulcer	8 yr.	1	Hematemesis, melena	Profound weakness	Cold, clammy, dusky grey pallor	70/50 110	1,600,000 30%	12 episodes of hematemesis and shock	13,500	Conservative	Jejunal ulcer with sclerotic vessel	Death
E. R.	51–2617	M, 18	Duodenal ulcer	3 yr.	None	Hematemesis, melena	Vertigo, weakness	Pale	85/60 100	3,000,000	Stopped bleeding	6,000	Conservative	None	Recovery
R. G.	51–194	F, 47	Duodenal ulcer	9 yr.	1	Hematemesis, melena	Vertigo, weakness	Pale	100/60 90	1,500,000 30%	1 recurrent episode of hematemesis and shock	3,000	Conservative	None	Recovery

catastrophic emergency, for there are few if any reliable prognostic guide posts. In the absence of these there is a tendency to clutch at straws. Over the years and with the growing mass of literature on the subject certain observations have recurred which, in a general way,

TABLE II
ANALYSIS OF TYPE OF HEMORRHAGE AND RESULTS

	No. of Cases	Per cent	Average Age (yr.)
Group I*	10	50	40.6
Group II†	1	5	40
Group III‡	9	45	47
Deaths	4	20	50
Emergency operations	3	15	40
Arrest with conservative therapy	13	65	41

* Spontaneous arrest after admission.
† Continuous hemorrhage until operation or cessation of bleeding.
‡ Recurrent hemorrhage.

have some limited prognostic value: first, massive hemorrhage occurring under the age of fifty will usually stop and is rarely if ever fatal; second, bleeding is usually much less serious in the female than it is in the male; third, a second or third hemorrhage is less apt to be fatal than a first hemorrhage; fourth, bleeding beyond forty-eight hours, when treated with surgery, is associated with a prohibitive mortality and should be treated conservatively. There is no doubt that these generalizations have a considerable element of truth. However, a careful analysis of our material reveals that to apply them as rules in order to arrive at a decision concerning therapy, when one is confronted with the individual case, is a pernicious practice and will, not uncommonly, result in disaster, as is borne out by the accompanying detailed analyses of the deaths in this series.

The use of surgery in the therapy of massive hemorrhage resulting from ulcer was first advocated by Finsterer[4] and Gordon-Taylor[6,7] in Europe and, in this country by Allen.[1,2] However, the difficulty lay in case selection and there is as yet no satisfactory method of determining, early in the course of bleeding, which patients will respond to conservative management and which will require surgery. Insofar as their course is concerned these cases generally fall into three groups: one, those patients who come in bleeding massively and who, under adequate replacement therapy, recover from the shock state with complete arrest of hemorrhage. These cases represent the largest group and obviously present no immediate problem as to management; two, those cases which, in spite of treatment continue to bleed massively after admission and whose general condition and blood pressure are barely maintained or continue to fall with continuous transfusion. These cases also present no problem in management for it is quite obvious that, if bleeding is not arrested surgically, under the support of massive replacement therapy, patients in this category will bleed to death as they may well do even before treatment is instituted. This group usually contains those mortalities known as unavoidable deaths and represents only a small fraction of the total number of cases of massive hemorrhage; three, those patients who respond to initial replacement therapy with recovery and arrest of hemorrhage, but after several hours, while at rest in the hospital, have a sudden recurrent episode of bleeding as indicated by the reappearance of the shock state or hematemesis. It is this third group which presents the greatest difficulty in deciding when and if surgical intervention should be undertaken. We are all familiar with this picture, presented only all too often at the mortality conference. A case of massive hemorrhage, following admission and adequate replacement therapy, has a most satisfactory clinical response with an apparent arrest of hemorrhage. However, after several hours there is a sudden recurrence of shock with or without hematemesis, or hematemesis without an associated fall in the blood pressure. An alert resident immediately administers a transfusion with several hundred cubic centimeters of blood and by the time the attending physician arrives the patient again appears in good condition. A note states that there has been a recurrent episode of hemorrhage but that bleeding now has apparently ceased, that the pulse and blood pressure are maintained, the general condition appears good and that therefore there is no indication for surgery at the present time; should bleeding recur then surgical intervention must be considered. This episode may recur two or three times. It is our belief, based on the following series of cases, that this particular point, following the first recurrent episode, is the time for decision, and that there are no criteria, clinical

or laboratory, that can foretell which patient will not bleed again and that waiting for a repeat hemorrhage is extremely hazardous.

ANALYSIS OF MATERIAL

This report is based on those cases admitted to the Beth David Hospital with a presenting complaint of gastrointestinal bleeding during the years 1950 and 1951. Although this may appear to be a relatively short period, it was deliberately chosen since the cases falling within its span would be fresh in memory and directly within the experience of the authors rather than deductions from a set of cold charts.

TABLE III
DISTRIBUTION AS TO SEX AND LOCATION OF ULCER

Total no. of cases	20
Females	6
Males	14
Gastric ulcers	4
Duodenal ulcers	14
Stomal ulcers	2

During this two-year period a total of 127 cases of peptic ulceration of the stomach and duodenum were admitted to the Beth David Hospital. Of these seventy-three or 57 per cent had bleeding of some degree as a presenting symptom. Only twenty or 27 per cent of these, or 15 per cent of the total, fulfilled the criteria of massive hemorrhage as outlined heretofore. (Table III.) Ten of these cases of massive hemorrhage or 50 per cent fell into group I, those having permanent spontaneous arrest following admission and treatment. One case or 5 per cent fell into group II, those with continuous unchecked hemorrhage. Nine cases or 45 per cent fell into group III, those with recurrent hemorrhage while at rest in the hospital. Of the total, three or 15 per cent underwent emergency operation. The procedure in each case was a subtotal gastrectomy. There were no deaths in the operated group. There were four deaths in the entire series, all due to hemorrhage in the conservatively treated group. This represents a 20 per cent mortality. It is our belief that three of these deaths were preventable had they been submitted to surgery at the proper time. It is to be pointed out again that this in no way adds to the argument concerning the superiority of one form of treatment over another. It simply indicates improper treatment or a failure to decide on the correct treatment at the proper time. Because of the clarity with which they point up the errors in judgment and the indications for therapy which at the bedside often seem so unclear, three of the deaths and the three cases in which operation was performed are presented in some detail as brief case reports.

CASE REPORTS

CASE 1. M. J., a fifty-one year old white female housewife, was admitted to Beth David Hospital on December 1, 1951, after a twenty-four-hour history of hematemesis, melena and extreme weakness. One and one-half years prior to admission the patient had been hospitalized at another institution for a similar episode and x-rays at that time revealed a duodenal ulcer. She was treated with transfusions and, following her discharge, remained well until three weeks prior to the present admission when she began having postprandial epigastric pain. There was no history of further bleeding until twenty-four hours before admission when she had several large tarry stools and one episode of hematemesis.

On admission the patient appeared extremely pale and weak although fully conscious. The blood pressure was 115/70, pulse 108, red blood cells 2,100,000, hemoglobin 32 per cent. The patient was put to bed at complete rest. Eight hours after admission she experienced an episode of profound weakness, pallor and cold sweat. The blood pressure fell to 80/60 and the pulse rose to 130. She responded to a transfusion of 1,000 cc. of whole blood, the blood pressure rising to 100/55. Twenty-four hours after admission the patient vomited 300 cc. of bright red blood. However, the blood pressure was maintained at 100/60 and during the next twenty-four hours her condition improved somewhat. Her blood pressure rose to 145/90, the red blood count to 3,700,000 following a total of 3,500 cc. of whole blood transfusions. Fifty-eight hours after admission the patient had her second episode of hematemesis while in the hospital and vomited about 350 cc. of bright red blood. However, again the blood pressure was maintained at 112/60 although the patient appeared extremely pale and washed out. It was decided to watch the patient further and transfusion was reinstituted. Four hours later the blood pressure was recorded as 118/80 following the infusion of 1,000 cc. of blood. One-half hour later the patient was found cold and pulseless with no

blood pressure. She failed to respond and was pronounced dead sixty-four hours after admission. Autopsy revealed a penetrating, callous ulcer of the duodenum.

Comment. This patient presented three distinct warnings as to her future course; one, the episode of shock eight hours after admission while at rest in the hospital and two episodes of hematemesis at twenty-four hours and fifty-eight hours after admission. While one might argue the decision after the first episode, each of the two subsequent episodes indicated a clear and present danger and were clear-cut indications for surgical intervention. This case demonstrates the serious prognostic import of hematemesis as an evidence of massive hemorrhage whether the blood pressure falls or not. It further demonstrates the pitfall of a maintained blood pressure in the face of massive hemorrhage. That this patient expired only one-half hour after a recorded blood pressure of 118/60 is an indication of the degree to which peripheral vasospasm may compensate for an almost depleted blood volume. It is fair to state that this was a preventable death.

CASE II. G. B., a forty year old white male, was admitted to the Beth David Hospital on April 2, 1950, complaining of weakness, dizziness and inability to stand. Twelve years prior to admission the patient was operated upon for a perforated peptic ulcer following a lengthy ulcer history. He remained relatively well until two months prior to the present episode when he began having persistent epigastric pain. During the ten days prior to admission he had tarry stools and several episodes of hematemesis. On the morning of the day of admission he fainted while getting out of bed.

Physical examination revealed a profoundly weak individual with extreme pallor. The skin was dry and there was no cyanosis. The blood pressure was 80/60, the pulse rate 120 and of thready quality. The red blood count was reported to be 4,400,000 with 67 per cent hemoglobin. The patient was put to bed and given an intravenous infusion of 1,000 cc. of saline followed by 250 cc. of plasma. He was put on a Meulengracht regimen which he took very well. However, the blood pressure failed to rise and eight hours after admission transfusion of whole blood was begun. The pressure rose to 106/76 but was maintained only as long as blood was administered at a rapid rate. The patient had a large tarry stool and several episodes of hematemesis. In spite of continuous transfusion the blood pressure fell to 60/40, the skin became cold and clammy and the patient expired in profound hemorrhagic shock sixteen hours after admission. The patient received a total of 2,000 cc. of whole blood. Permission for autopsy was not obtained.

Comment. This case is representative of the smallest group of massive bleeders, characterized by severe continuous hemorrhage, in which despite transfusion the pressure is only barely maintained or continues to fall. The replacement therapy here can by no means be considered adequate and the danger of withholding transfusion in the face of hemorrhagic shock is clearly evident. It is doubtful, if in continuous massive hemorrhage of this degree, a fatality could have been avoided. However, it is clear that a more vigorous approach with immediate, massive replacement therapy might have sufficiently rehabilitated the patient so that a surgical procedure could have been considered. This was the only possibility for a successful outcome. It demonstrates further how misleading single blood counts, in the face of long-standing bleeding and hemoconcentration, compounded with human error, may be.

CASE III. J. G., a fourty-four year old white male, was admitted to the Beth David Hospital on August 31, 1951, complaining of hematemesis and melena of three days' duration and marked weakness. Eight years prior to admission he had undergone an operation for duodenal ulcer but was unaware of the nature of the procedure. With the exception of an episode of melena nine months before, he had been essentially well in the interval between the operation and the present illness.

Physical examination revealed a conscious, rational patient in obvious shock. The skin was cold and clammy with a dusky gray pallor, the blood pressure 70/50, the pulse rate 110 and almost imperceptible, red blood count 1,600,000 with 30 per cent hemoglobin. Shortly after admission the patient vomited a large amount of bright red blood. Transfusion was begun followed by gradual improvement. Six hours after admission the patient had received 2,000 cc. of blood. The blood pressure was 110/70, the pulse rate 96 and of good quality. Five hours later or eleven hours after admission, the patient vomited an estimated 1,500 cc. of blood followed by a recurrence of shock, the blood

pressure falling to 80/60. Transfusion was again instituted with recovery. Three hours later he again vomited about 1,500 cc. of blood followed by shock, and again recovery followed transfusion. Ten hours later a third large hematemesis occurred associated with shock, cyanosis and air hunger. He again responded to transfusion but during the following thirty-six hours he had repeated episodes of hematemesis, the blood pressure fluctuating between 60 to 120 systolic, normal levels being maintained only by constant rapid transfusions of whole blood. However, even in intervals of elevated pressure he appeared profoundly ill with ashen pallor, air hunger, cyanosis and a pulse rate maintained at 120 to 140. On the third hospital day he had a period of improvement lasting for some twelve hours, but it was believed he was in no condition to withstand an operative procedure. Bleeding recurred and in spite of massive transfusion he expired in profound hemorrhagic shock eighty-four hours after admission. He had received a total of 14,000 cc. of whole blood. Autopsy revealed a gastroenterostomy which was the site of an anastomatic ulcer with a large open blood vessel.

Comment. This patient presented three episodes of hematemesis during the first twenty-four hours in the hospital, each associated with shock and recovery. There was nothing to indicate that hemorrhage would not recur and operative intervention should have followed the first recurrent episode, certainly after the second or third. In spite of massive transfusion the patient was never again in satisfactory condition after the third episode. The reason becomes evident when one considers that he had been bleeding for three days prior to admission. The case points up the fallacy of ignoring recurrent episodes of hemorrhage because of temporary recovery. The condition of the patient gives no clue as to whether or not bleeding will recur, and unfortunately, recurrence may be associated with a suddenly deteriorated condition that, in spite of massive blood replacement, is not reversible and the opportunity is lost.

Case IV. R. B., a fifty-seven year old white female was admitted to the Beth David Hospital on January 2, 1951, complaining of hematemesis, melena, weakness and vertigo of two days' duration. Seven years prior to admission the patient had had a similar attack. However, there had been no further bleeding up to the present episode. There had been repeated bouts of epigastric pain, radiating to the back, relieved by food.

Physical examination revealed a markedly pale individual fully conscious and rational. The blood pressure was 126/84, pulse rate 130, the red blood count reported as 3,700,000 with 67 per cent hemoglobin. The patient was put at complete bed rest and given a transfusion of 1,000 cc. of whole blood. Twenty-four hours after admission she vomited 1,000 cc. of bright red blood. The blood pressure fell to 90/60, the red blood count to 2,500,000 with 55 per cent hemoglobin. She was immediately given 1,000 cc. of whole blood with an excellent response. Forty-eight hours later the patient again vomited about 300 cc. of bright red blood and the blood pressure fell to 90/60. There was marked pallor, cold sweat and the pulse rate rose to 120. The patient was transfused with 1,000 cc. of whole blood and transferred to the operating room. Exploration revealed the stomach and bowel filled with blood. There was a large callous ulcer on the lesser curvature. A subtotal resection including the ulcer was performed. Recovery was uneventful. The patient received a total of 4,500 cc. of blood.

Comment. This case again points out that patients with one recurrent episode of hemorrhage while at rest in the hospital will very likely have another such episode. Decision as to surgery was delayed here until the second recurrent hemorrhage. There is no logical justification for this delay, and the danger of this wait-and-see policy is markedly increased in patients beyond the age of fifty. It is our belief that surgery should have been decided on following the first recurrence of bleeding. The patient had a fortunate outcome but there was no reason to subject the patient to additional anoxia and the added chance for irreversible shock. Such a policy will in the long run add an unwarranted mortality.

Case V. S. F., a twenty-two year old white female, was admitted to the Beth David Hospital on November 26, 1951, with a history of hematemesis, tarry stools and severe epigastric pain of three days' duration. Three months prior to admission the patient began having attacks of epigastric pain relieved by food. There had been no bleeding up to the present attack. On the day of admission the patient had eleven episodes of hematemesis.

Physical examination revealed a young, bled-out appearing female. The skin was cold with a greyish pallor. The blood pressure was 90/60, pulse 110, the red blood count 3,000,000 with 62 per cent hemoglobin, the hematocrit 26 per cent. She was placed at complete bed rest and following a transfusion of 1,000 cc. of whole blood her pressure rose to 112/60, pulse 90 and she appeared much improved. Forty-eight hours after admission the patient vomited 1,000 cc. of bright red blood. She appeared cold, clammy and cyanotic. The blood pressure fell to 90/60 and the pulse rate rose to 110. She responded well to 1,000 cc. of whole blood and the blood pressure rose to 100/68, the pulse falling to 96. Because of her youth and satisfactory response to transfusion it was decided to observe the patient further. She continued having epigastric pain despite medication and on the fourth hospital day she had a second episode of hematemesis followed by shock, the blood pressure falling to 80/60, the pulse 120. She again responded well to transfusion but twelve hours later she had three episodes of massive hematemesis within a three-hour period and it was only by continuous rapid transfusion of 4,500 cc. of blood that the blood pressure was maintained at a reasonable level. It was clearly evident that exsanguination was imminent and, with massive replacement therapy, a subtotal resection was performed. The specimen revealed multiple erosions in the mucosa of the antral portion of the stomach. Recovery was uneventful.

Comment. It is evident that, when confronted with the individual case, generalizations drawn from the age or sex of the patient are often misleading. In this case of a twenty-two year old female with massive hemorrhage the indication for surgical interference, following the episode of recurrent bleeding after a period of rest in the hospital, was clear. Had this indication not been obscured by the belief that bleeding would stop spontaneously because of the patient's youth, the dilemma of having to operate in the face of continuous massive hemorrhage and impending shock would have been avoided.

Case VI. C. O., a forty-four year old white male, was admitted to the Beth David Hospital on January 15, 1951, complaining of syncope, hematemesis and melena of twenty-four hours' duration. Four years prior to admission the patient had had a perforated ulcer repaired. Since that time he had had repeated remissions and exacerbations of epigastric pain relieved by food. On the day prior to admission he began having melena. On the afternoon of admission he had an episode of syncope followed by hematemesis of about 500 cc. of blood. Physical examination revealed a conscious, rational white male with marked pallor and a grey cyanosis of the mucous membranes. The blood pressure was 90/60, the pulse rate 110, thready in quality. Immediately following admission the patient vomited about 500 cc. of bright red blood. The red blood count was reported as 4,000,000 with 77 per cent hemoglobin. He was put to bed at complete rest and following the infusion of 2,000 cc. of whole blood the pressure rose to 100/60, the pulse rate fell to 90 and he appeared much improved. He was placed on a Sippy regimen and on the following day the patient vomited about 500 cc. of bright red blood. He became cold, clammy and cyanotic. The blood pressure fell to 90/50 and the pulse rate rose to 120. He was given a transfusion of 1,000 cc. of whole blood and as soon as the shock state was overcome he was transferred to the operating room where an exploration revealed a callous ulcer of the lesser curvature of the stomach. A subtotal gastrectomy was performed. Recovery was uneventful. The patient was discharged on the fourteenth postoperative day.

Comment. We believe that therapy here was not only correct but applied at the proper time; that is, following the first recurrent episode after cessation of massive bleeding. Done at this stage, with adequate replacement therapy, the mortality should be no greater than that of elective gastric resection. It is probably true that in following this rule an occasional patient will be operated upon as an emergency, that might have stopped bleeding under an expectant regimen. At the present time, however, this knowledge is by no means given to us. Furthermore, since practically all of these cases will eventually require elective resection, there can be no valid reason for postponing surgery to a time when repeated bouts of anoxia have made the risk prohibitive. Massive hemorrhage in the presence of known gastric ulcer, because of the proximity of the left gastric artery, makes surgical intervention even more imperative.

OBSERVATIONS

In reviewing this small series of cases one is impressed with the lack of any prognostic signs. The usual criteria which indicate a patient's condition such as pulse, blood pressure, general appearance, while they may indicate that a patient is actively bleeding, are essentially valueless as to whether the patient will bleed again once hemorrhage is arrested. It is well enough to say that treatment must be individualized; but in the face of recurrent hemorrhage, in which prediction is impossible, some type of clear-cut plan is required. The reaction to repeated blood loss is extremely variable, and after a second or third hemorrhage the change, from what is apparently a satisfactory condition, to profound irreversible shock may occur with frightening rapidity (Case 1). Hinton[9] first presented the idea of a test of transfusion in 1940. However, it remained for Holman[11] and Heuer,[8] in conclusions drawn from a lengthy series at the New York Hospital, to present a clear cut plan of case selection based on the response of the patient to therapy. This has been restated in one way or another in several reports.[10,12] However, in essence, the indications for surgical intervention in massive hemorrhage boil down to the following:

1. A continuing massive hemorrhage in which the blood pressure and general condition of the patient are maintained only by continuous transfusion.

2. A massive hemorrhage which, following replacement therapy, is arrested with stabilization of blood pressure and the general condition but which, after several hours at rest in the hospital, recurs, as evidenced by the shock state or by hematemesis without necessarily a fall in blood pressure.

It is to be pointed out that hematemesis in recurrent bleeding is an extremely serious sign and indicates severe bleeding even if only 100 to 300 cc. of blood are vomited. The fact that the blood pressure is occasionally maintained in the face of this should not deter one from accepting it as a major hemorrhage and acting accordingly. A repeat hemorrhage may totally deplete a border line blood volume, where pressure is being maintained by peripheral vasospasm, with a resulting precipitous irreversible shock. Recurrent bleeding is a probable indication of an open major vessel and there is no adequate reason to believe that it will not recur again. The fact is that having recurred once, it will very likely recur again. These bouts of anoxia with repeated upsets in hemodynamics are profoundly damaging to vital centers in all cases, but particularly so in older age groups, and with each episode life becomes more tenuous and any contemplated surgery infinitely more hazardous. We therefore believe that the first recurrent episode is an immediate indication for operation intervention. Should this opportunity have been missed, we believe that the forty-eight-hour rule is not to be applied too rigidly. There is no doubt that with the prolonged inevitable anoxia the risks of surgery increase and early decision is much to be desired. However, more liberal application of the rule with extension of the time limit will often afford a successful resection in a case which would otherwise have resulted in a mortality. There is no doubt however that the risks increase sharply when surgery is attempted beyond forty-eight hours.

CONCLUSIONS

1. Recurrent massive hemorrhage is a probable indication of an open major vessel.

2. There are no criteria, clinical or laboratory, which can predict whether or not bleeding will recur.

3. On the basis of probability once bleeding has recurred it will in all likelihood recur again.

4. The patient's condition deteriorates with each succeeding episode in spite of replacement therapy and makes surgery more hazardous.

5. Because of the narrow margin of tolerance a recurrent hemorrhage may result in an irreversible shock state.

6. There is no logical reason for delaying surgical interference beyond the first recurrent episode.

REFERENCES

1. Allen, A. W. and Benedict, E. B. Acute massive hemorrhage from duodenal ulcer. *Ann. Surg.*, 98: 736–749, 1933.
2. Allen, A. W. Acute massive hemorrhage from the upper gastrointestinal tract. *Surgery*, 2: 713–731, 1937.
3. Amendola, F. H. The management of massive gastrointestinal hemorrhage. *Ann. Surg.*, 129: 47–56, 1949.
4. Finsterer, H. Surgical treatment of acute profuse gastric hemorrhage. *Surg., Gynec. & Obst.*, 69: 291–298, 1939.

5. Fraser, R. W. and West, J. P. The management of bleeding duodenal ulcers. *Ann. Surg.*, 129: 299–303, 1949.
6. Gordon-Taylor, G. The problem of bleeding peptic ulcer. *Brit. J. Surg.*, 25: 403–425, 1937.
7. Gordon-Taylor, G. The present position of surgery in the treatment of bleeding peptic ulcer. *Brit. J. Surg.*, 33: 336–345, 1946.
8. Heuer, G. J. The surgical aspects of hemorrhage from peptic ulcer. *New England J. Med.*, 235: 277–283, 1946.
9. Hinton, J. W. Massive hemorrhage in peptic ulcer. *Ann. Surg.*, 110: 376–379, 1939.
10. Hoerr, S. O., Dunphy, F. E. and Gray, S. J. The place of surgery in the emergency treatment of acute, massive upper gastrointestinal hemorrhage. *Surg., Gynec. & Obst.*, 87: 338–342, 1948.
11. Holman, C. W. Severe hemorrhage in gastroduodenal ulcer. *Arch. Surg.*, 40: 150, 1940.
12. Lipp, W. F., Lipsitz, M. H., Milch, E. and Aaron, A. H. Management of massive hemorrhage from gastroduodenal ulceration. *J. A. M. A.*, 145: 14–16, 1951.
13. Meulengracht, E. Fifteen years experience with free feeding of patients with bleeding peptic ulcers. *Arch. Int. Med.*, 80: 697–708, 1947.
14. Wangensteen, O. H. Surgical arrest of massive hemorrhage in duodenal ulcer. *Surgery*, 8: 275–288, 1940.
15. Warren, R. and Lanman, T. H. Surgery in bleeding peptic ulcer. *Surg., Gynec. & Obst.*, 87: 291–298, 1948.

In patients with advanced cancer of the prostate our most effective therapy seems to be orchiectomy and/or estrone therapy. Many such patients are greatly benefited even though only temporarily, although a few patients remained apparently well for as long as four years. It is too early, however, to state that any of these patients were permanently cured. (*Richard A. Leonardo, M.D.*)

THE OFFICE MANAGEMENT OF LEUKORRHEA

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LEUKORRHEA means increased vaginal discharge but the term is often used loosely to include any abnormal vaginal discharge, even blood-tinged. It is a symptom rather than a disease and is one of the most common complaints for which patients seek help, particularly if the discharge is accompanied by itching or burning.

The various causes of leukorrhea are summarized in Table 1. In the routine investigation of leukorrhea gloves and instruments free from external powder or lubricant are used so as to avoid interference with the performance of the various examinations.

EXAMINATIONS

Genitalia. The external genitalia are examined. Skene's ducts are palpated. They are best felt by placing the palmar surface of the index finger 1 cm. within the introitus, and sweeping this finger from within out, toward the urethral meatus. Bartholin's glands are palpated. The right gland is felt by pinching the vulva at about 7 o'clock between the thumb and index finger of the right hand. The left gland is similarly felt with the left hand at 5 o'clock. These glands are normally not felt; therefore, any enlargement is evidence of past or present disease. If any pus is expressed from the opening of Bartholin's glands or the urethra, a smear and culture should be sent to a laboratory for the detection of gonococci.

Papanicolaou Smears. These are taken to exclude malignancy if the discharge is blood-tinged or, prophylactically, if the patient is over thirty-five years of age. For routine use, the following surface biopsy technic is recommended: Spread the vulva and insert an *unlubricated* vaginal speculum to expose the cervix. Using a tongue depressor or spatula (Ayre),[1] take material from the bottom blade of the speculum and spread it thinly on a clean glass slide. The slide is immediately placed into a bottle containing equal parts of 95 per cent alcohol and ether. (Blood in the smear does not hinder the cytologic examination.) The edge of the spatula is then inserted into the external os of the cervix and the cervix is scraped with a rotary motion. This material is likewise spread on a glass slide and placed into the alcohol-ether mixture. The container, properly labeled, is then sent to a skilled vaginal cytologist for examination. There are many variations in technic. The more commonly used are: aspiration method,[2] sheaths,[3] sponge biopsy[4] and Gusberg curet.[5] After obtaining the smears and while the speculum is still in place, the vaginal walls and cervix are carefully inspected and the type of discharge is noted.

Wet Smear. This is the most important test for the diagnosis of the common causes of leukorrhea. A microscope with high-dry objective, glass slides and cover slips, and normal saline are necessary for correct diagnosis. The following technic is used: A drop of normal saline is placed on a glass slide. A drop of secretion from the bottom blade of an unlubricated dry speculum is mixed with the saline. A cover slip is then placed on the mixture and the slide is examined under high-dry power.

By means of the wet smear the physician can detect three of the most common causes of troublesome leukorrhea, namely, vaginitis due to trichomonas, monilia and senile atrophy.

If the patient has douched or used intravaginal medication within a week of examination, she may have "washed away the evidence." Under these circumstances, if a definite diagnosis cannot be made, the patient is instructed to refrain from douching and return a week later for re-examination.

In the *normal* wet smear there are variable numbers of vaginal epithelial cells of the cornified type, bacilli and very little else. (Fig. 1.)

In *trichomonas vaginalis vaginitis* (Fig. 2) the trichomonad is recognized as a pear-shaped or round organism somewhat larger than a white cell and characteristically moving to-and-fro with a whip-like motion. This is quite different from the "downstream" motion of white cells before the drop has become entirely stationary. Pus cells are always present and in

TABLE 1

CAUSES, SYMPTOMS AND TREATMENT OF LEUKORRHEA

Types of Leukorrhea	Etiology	Usual Type of Discharge	Itch	Physical Examination	Wet Smear	Diagnosis	Treatment
				Physiologic			
Ovulatory	Physiologic	Mucoid	Absent	Negative	Normal; no pus cells	History	None
Congestion:							
Pregnancy	Physiologic	Mucoid	Absent	Negative	Normal; no pus cells	Physical examination; normal smear	None
Premenstrual	Hyperemia	Mucoid	Absent	Negative	Normal; no pus cells	History	None
Sexual	Hyperemia	Mucoid	Absent	Negative	Normal; no pus cells	History	Sexual hygiene
				Pathologic			
Vulvitis:							
Skenitis	Bacterial	Purulent	Absent	Skenitis	Pus cells	Physical examination; Gram's stain and culture	Varies
Bartholinitis	Bacterial	Purulent	Absent	Bartholinitis	Pus cells	Physical examination; Gram's stain and culture	Varies
Vaginitis:							
Trichomonas	Trichomonad	Greenish, foamy, malodorous	Present	Vaginitis and/or vulvitis	Trichomonads; pus cells	Wet smear	Floraquin; others
Monilia	Monilia albicans	Whitish, cheesy	Present	Vaginitis and/or vulvitis	Spores or mycelia; pus cells	Wet smear	Gentian violet; propionic jellies
Senile	Estrogen deficiency	Thin, sometimes blood-tinged	Present	Atrophic vaginitis	Basal cells; pus cells	Physical examination; wet smear	Estrogen vaginally
Gonorrheal (children)	Gonococcus	Purulent	Absent	Vaginitis	Pus cells	Gram's stain and culture	Penicillin parenterally
Foreign bodies	Varies	Malodorous	Absent	Foreign body	Pus cells	Physical examination	Removal
Cervicitis:							
Non-specific and erosion	Mixed bacteria	Purulent	Rare	Endocervicitis or erosion	Pus cells	Examination of cervix	Electrocautery
Gonorrheal	Gonococcus	Purulent	Absent	Endocervicitis or erosion	Pus cells	Gram's stain or culture	Penicillin parenterally
Carcinoma of cervix	Unknown	Blood-tinged	Absent	Cervical lesion	Pus cells; red cells	Examination of cervix; biopsy	Hospital
Endometritis:							
Postpartum and postabortal	Mixed bacteria	Bloody	Absent	Signs of recent pregnancy	Pus cells; red cells	History and physical examination	Antibiotics
Tuberculous	Tubercle bacillus	Variable	Absent	Variable	Pus cells	Endometrial biopsy	Streptomycin or surgery
Sloughing myoma or polyp	Degeneration	Bloody	Absent	Tumor on vaginal examination	Pus cells	Physical examination	Hospital
Pyometria	Mixed bacteria	Purulent	Absent	Symmetrically enlarged and soft	Pus cells	Physical examination	Hospital
Carcinoma of endometrium	Unknown	Blood-tinged	Absent	Variable	Pus cells; red cells	Curettage	Hospital
Debilitating illness	Varies	Watery	Absent	Debilitation	Normal; no pus cells	History and physical examination	Varies

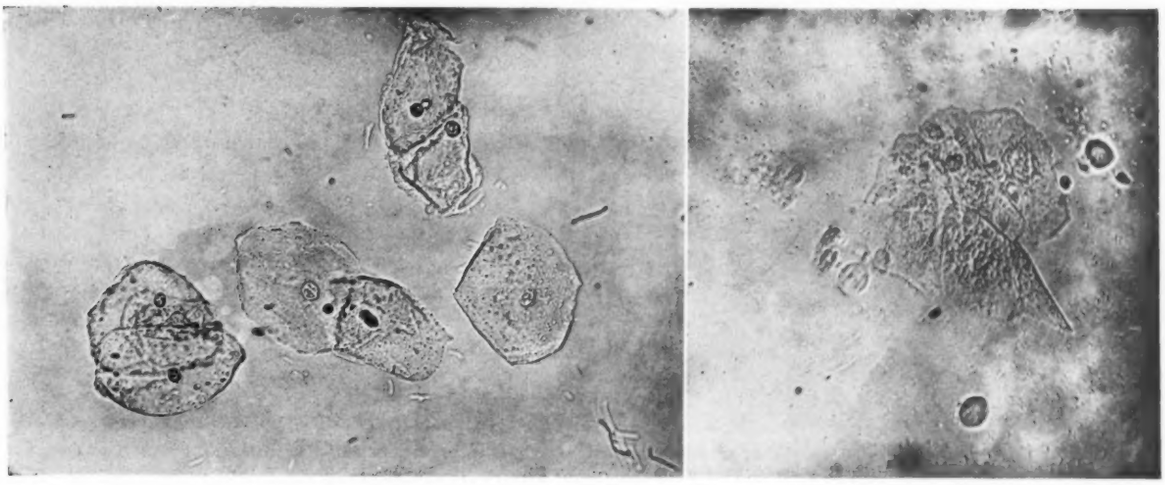

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FIG. 1. Normal wet smear showing cornified vaginal epithelial cells and Doderlein bacilli (high-dry power).

FIG. 2. Wet smear in trichomoniasis. The trichomonads are recognized by their to-and-fro motion, here seen as a blur.

acute cases usually outnumber the epithelial cells.

In the detection of *monilia vaginitis* (Fig. 3) select an area with relatively few cells and diminish the light sources to almost dim. Under high-dry power look for the very small spores, about one-fourth to one-eighth of the size of white cells. Only those spores bearing buds are pathognomonic. Look also for the long, thin mycelium filaments although these may be absent in milder cases.

In typical cases of *senile vaginitis* (Figs. 4 and 5) there is a change in the type of epithelial cells from the usual cornified type to basal cells. Pus cells are usually present, the quantity depending upon the degree of inflammation.

In severe cases the inflammation may be so great that the wet smear shows masses of pus cells and practically no epithelial cells of any type. A Papanicolaou smear to confirm the diagnosis and help exclude malignancy is desirable, particularly in those cases in which there is bloody discharge.

Biopsy. If there is a cervical lesion with any suspicion of malignancy, a biopsy is taken at this time and placed into a 10 per cent formalin solution.

Pelvic. A careful bimanual and rectovaginal examination is now done to determine if there is any gross pelvic disorder.

FIG. 3. Wet smear in moniliasis. The presence of either budding spores or mycelia is diagnostic.

COMMENTS

Each of the differential diagnoses is now separately considered in relation to the history, physical examination and laboratory findings. Specific therapy is discussed in connection with each diagnosis.

Physiologic Leukorrhea. An increased amount of clear, mucoid, non-irritating discharge may be seen at the time of ovulation, during pregnancy, before menstruation and as

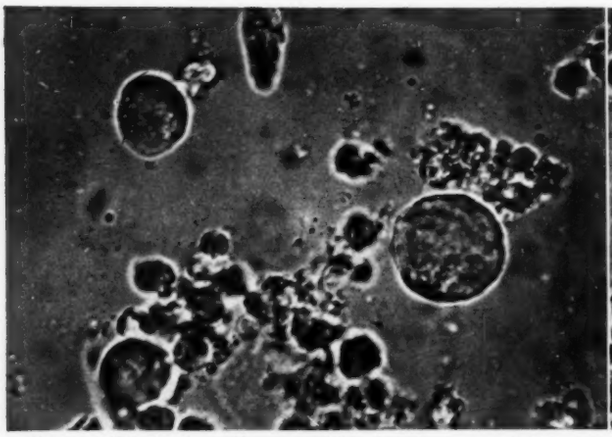

FIG. 4. Typical senile vaginitis showing round basal cells and clusters of white cells.

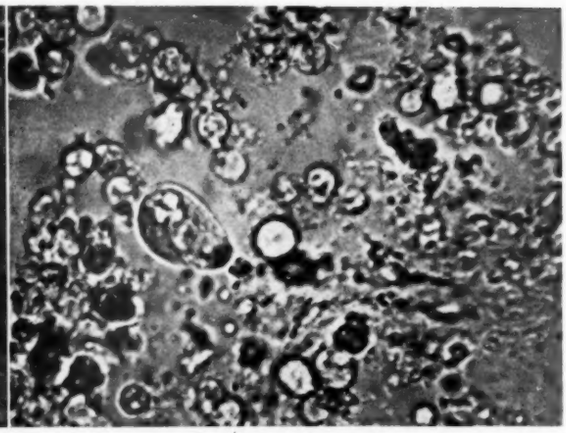

FIG. 5. Severe senile vaginitis showing masses of white cells, only one basal cell.

the result of pelvic congestion.[6] This discharge is characterized by the absence of pus cells or pathogenic organisms and results from increased secretions chiefly from the endocervical and Bartholin glands. During pregnancy, in addition, a white, "clotted milk" discharge may be noted which when examined microscopically shows an abundance of squamous epithelial cells.

No therapy is required beyond simple reassurance in such patients except in those cases in which sexual factors play a role. The etiology of pelvic congestion is obscure and the physical findings are extremely variable. A valuable sign is thickening and tenderness of the uterosacral ligaments—the so-called "posterior parametritis." Although the cause may not be readily evident, faulty sex habits such as coitus interruptus, unsatisfied sexual desires, prolonged sexual stimulation and emotional factors play an important role. In cases, therefore, in which there is an abundant clear mucoid discharge not associated with ovulation, the premenstrual period or pregnancy, a sympathetic attempt should be made to correct any abnormal sexual and emotional factors.

Pathologic Leukorrhea. Lesions of the external genitalia and vulva rarely cause discharge as a major complaint. An abscess of Skene's duct or of Bartholin's gland may occasionally be responsible. These lesions are best treated by the administration of antiobiotics and/or incision and drainage if necessary.

Vaginitis is the most common cause of pathologic discharge in women. *Trichomonas vaginalis vaginitis* is one of the most common causes of leukorrhea seen in office practice. The source of infection is not clear. Symptoms vary from mild discomfort to intense itching, pain and dyspareunia associated with marked vulvovaginitis. Occasionally trichomonads may be demonstrated in the absence of symptoms.

The discharge is characteristically frothy, greenish and purulent, with little if any mucus present. Diagnosis is made on wet smear as previously described. Some investigators do not believe that the trichomonad itself is the essential pathogen involved but this is not of practical importance.

Although there is no universally satisfactory *treatment* for all cases of trichomonas vaginitis, the insertion of antiseptic vaginal suppositories or jellies preceded by highly acid douches usually proves satisfactory. Almost any of the treatments advocated will relieve symptoms while the patient is on therapy. The aim, however, is to use the kind of medication which will give the least number of recurrences after cessation of the treatment. Obviously no one method is successful for all cases.

The following regimen is recommended: At the initial visit the diagnosis is made by microscopic examination of the wet smear. The vagina is exposed with a speculum and thoroughly cleansed with one-half strength green soap solution, then sponged dry and insufflated with floraquin® powder.

The patient is instructed in the technic of douching (i.e., lying down in the bathtub) and is advised to douche with a solution of 4 tablespoons of ordinary vinegar to 2 quarts of warm water immediately before retiring.

Following the douche, when in bed for the night the patient places two floraquin tablets into the vagina as high as her finger can reach. It is advisable that she wear panties to prevent soiling of bed clothes; sanitary napkins are not employed because of the irritation they may produce at this time.

This home treatment is continued each night through two menstrual cycles. At the time of menstruation douches are omitted but the suppositories must be inserted.

Following completion of the foregoing therapy the patient stops all treatment for one week and returns to the office for re-examination. If the patient has been entirely symptom-free and if there is no vulvovaginitis on examination or trichomonads in the wet smear, she is instructed to continue the insertion of floraquin suppositories during menstruation for the next six months. This is advised because reinfection is most common during the menstrual period.

If at the time of re-examination trichomonads are still found in the wet smear, with or without recurrent symptoms, it is best to substitute another drug. A very good alternate is carbarsone, one suppository each night, used the same way; douching is not essential with this drug.[7] Among the many other drugs* which may be successful where others have failed are: devegan,® aldarsone,® vioform,® silver picrate, nylmerate jelly,® triple sulfa cream® and westhiazole jelly®.

For the small percentage of cases that show persistent recurrence shortly after the cessation of any form of therapy, Cagos suppositories, one nightly, are recommended for prolonged use. These suppositories give symptomatic relief without cure. Recurrence has been ascribed to foci in the male as well as to the patient's own urinary tract. When there is persistent recurrence despite "adequate" therapy, examination of a catheterized urine specimen is indicated. The husband's urine and prostatic secretions are examined for a possible source of reinfection.[8]

Monilia vaginitis is another common cause of discharge in women and is often seen during pregnancy. A large number, if not all, of so-called diabetic vulvovaginitis cases are of monilial origin. Inspection of the vaginal walls and cervix often reveals the typical cheesy, white plaques associated with a variable amount of vaginal and vulval inflammation.

Diagnosis is made by finding the characteristic yeast spores and/or mycelia on the wet smear.† Direct scraping of the plaques is helpful. (Fig. 3.)

As with trichomoniasis, many drugs have been recommended for *treatment*. The following regimen has been found satisfactory: At the initial visit a vaginal speculum is inserted. The vagina is sponged free of discharge and carefully painted with an aqueous solution of 2 per cent gentian violet. (One-half per cent gentian violet may be used for the occasional patient who is irritated by the 2 per cent solution). Propion-gel, 5 cc., as measured in the applicator supplied by the manufacturer, is inserted by the patient high into the vagina morning and night for two weeks, then each night for the next two weeks. The patient douches with 2 quarts of warm water containing 6 tablespoons of baking soda each night before application of the jelly. It has been shown that monilial vaginal infections are frequently associated with avitaminosis,[9] and appropriate multivitamin preparation is given if signs of deficiency are present.

Monilia vaginitis does not respond as quickly as trichomonas vaginitis to proper therapy. Thus one should keep in mind that it may be five to six days before an acute case experiences complete relief under treatment.

Various other drugs have been recommended for the treatment of monilial vaginitis. These include alcoholic gentian violet applications, iodine douches, floraquin suppositories, gentiajel,® AVC cream, westhiazole jelly, etc. The important thing to watch for is sensitivity to medication manifested by aggravation of symptoms while undergoing therapy. A different drug should be used if this occurs.

Flare-ups of acute monilial vaginitis often occur when a patient takes chemotherapy for some other condition. This is because the antibiotic (penicillin, aureomycin, etc.) eliminates normal vaginal flora, allowing fungi uninhibited growth. Treatment of the vaginitis will meet

* An occasional patient may become sensitive to a particular drug, especially to the arsenical group (carbarsone, aldarsone). This is manifested by increased irritation and pruritus while on medication. The patient should be warned to discontinue any therapy which aggravates her symptoms.

† In milder cases mycelia "filaments" are often absent on wet saline smear; careful search will, however, reveal the tiny yeast spores.

with little success until the antibiotics are discontinued.

Senile vaginitis is not primarily an infection but is due to atrophy of the vaginal mucosa resulting from the loss of ovarian function. The subsequent inflammatory changes may produce both leukorrhea and irritation. In addition, because of the loss of elasticity of the mucosa small fissures and bleeding spots are often present and produce spotting or a blood-tinged discharge. For this reason as well as the patient's age, careful vaginal smears should be made to exclude malignancy, even though the wet saline smear shows the characteristic "atrophy cells."

Senile vaginitis responds readily to the use of estrogen suppositories. Amniotin® suppositories (2,000 international units each) should be prescribed with directions to insert one high into the vagina each night for two weeks, then two to three times a week for the following month. As alternatives, stilbestrol tablets (0.5 mg.) or an estrogenic cream such as premarin® cream or dienestrol® may be used, particularly for the occasional patient who is sensitive to the glycerine base of amniotin suppositories.

For the external pruritus often present 1 per cent phenol in cold cream gives relief.

The oral or parenteral administration of estrogens is not advised in cases of senile vaginitis because of the greater tendency to produce bleeding from the uterus with systemic preparations.

Gonorrheal vulvovaginitis is encountered only in pediatric gynecology. The diagnosis is made by laboratory demonstration of gonococci on smear or culture.

Prompt cure is effected by the parenteral administration of procaine penicillin, 300,000 units in aqueous solution, daily for five days. Other antibiotics such as aureomycin, terramycin or chloromycetin may be used. Penicillin suppositories and estrogenic suppositories are not as effective.

Foreign bodies are rare in the adult woman, but a tampon or pessary may be forgotten and produce foul, unpleasant leukorrhea. The removal of the foreign body and the use of lukewarm cleansing douches and sitz baths cause prompt regression of symptoms. In senile cases estrogen suppositories aid in the healing of the pressure ulcers caused by neglected pessaries.

In children, foreign bodies should never be forgotten as a cause of vaginitis and discharge. Careful inspection (with a small endoscope if necessary) will generally reveal the diagnosis.[10]

Erosion of the cervix is a bright red lesion about the external os, composed of endocervical epithelium which has replaced the stratified squamous epithelium normally present in this area. Erosion most frequently follows postpartum or non-specific inflammation, occasionally gonorrhea. Hormonal factors (pregnancy erosion) or congenital factors (congenital erosion) may occur in the absence of inflammation.

Early carcinoma of the cervix may resemble an erosion. If there is any doubt as to the diagnosis or if the erosion does not heal under therapy, biopsy is indicated.

Endocervicitis is usually caused by nonspecific organisms but gonorrheal disease should be kept in mind. The condition is almost invariably associated with some inflammation of the fibromuscular tissue of the cervix. In typical cases a ribbon of pus may be seen exuding from the external os. There is often an associated erosion. One may also see variable-sized cysts on the cervix (Nabothian cysts), which are the result of healed or healing erosion. After childbirth simple lacerations or hypertrophy of the cervix are common and require no treatment if uninfected. Similarly, eversion of the cervix is the result of deep bilateral lacerations and clinically resembles an erosion although no real erosion exists.

Endocervicitis and erosion are best *treated* by electrocautery;[11] for this purpose the nasal tip cautery is both satisfactory and safe.* The best time to cauterize is within one week after cessation of a menstrual period. In postpartum cases three months after delivery is a good time for treatment.

A bivalve speculum is introduced and the cervical canal is wiped clean. If a mucous plug is present, an applicator saturated with "caroid powder" is placed into the cervical canal and slowly rotated to remove the plug. The rheostat of the cautery is turned on enough to make the cautery tip a cherry red color. *Erosions* are treated with radial cauterization using linear stripes, beginning at the external os and extending ½ inch beyond the margin of the erosion. These stripes are placed about ¼ inch

* If gonorrhea is suspected or confirmed by culture, treatment should be deferred until a course of penicillin is given (300,000 units daily for five days) and all signs of acute cervicitis have subsided.

apart. After cauterizing the erosion the cautery tip is placed into the cervical canal up to the level of the internal os (where it meets resistance), so as to make a single line of cauterization in the canal. The location of this line may be arbitrarily chosen at 6 o'clock. If subsequent cauterization of the cervical canal is necessary, a different line is chosen after an interval of eight weeks. The radial cauterization of the external cervix may be done at shorter intervals if desired.

The patient is told that following electrocautery there is usually considerable discharge or spotting within two weeks. This may be minimized by the use of antiseptic jellies such as triple sulfa cream, one plunger-full nightly for two weeks; penicillin suppositories containing 200,000 units each may be substituted.

The most serious complications of cauterization are stricture of the cervical canal and hemorrhage, as a result of too energetic treatment. These sequelae are rare when a fine, nasal tip cautery is properly used. For severe bleeding which occurs ten to fourteen days after therapy place a strip of oxycel gauze, or an applicator dipped in negatan® solution, directly against the bleeding point and maintain pressure for several minutes. For stricture the cervix should be sounded and, if necessary, dilated every three months for one year following treatment.

Conization of the cervix is preferred when in addition to inflammatory disease there is marked hypertrophy of the cervix. This is best performed in a hospital. Electrocoagulation is not recommended for routine use. Other methods of treatment of the diseased cervix, such as chemical caustics, dry ice, ionization, chemical antiseptics and antibiotics, may be employed by those skilled in their use.

In *gonorrheal cervicitis* careful questioning will usually elicit a history of sexual exposure. It is important to ask about associated symptoms, such as dysuria and frequency, as well as to look for other stigmas of acute or chronic gonorrheal infection. The urethra, Bartholin's glands and Skene's ducts are palpated and milked for pus. Bimanual examination may reveal thickened or tender adnexa from past or present infection. The cervical discharge is typically "creamy" and there may be associated erosion. There is no vulvovaginitis, irritation or itching unless a vaginal infection coexists.

Diagnosis is made by demonstration of gonococci on smear or culture of the pus.

The minimum *treatment* is parenteral administration of penicillin, 300,000 units daily, for five days. Smears and cultures from the urethra and cervix should be negative for gonococci on at least two subsequent occasions three to four weeks apart. Treatment by other antibiotics is under current investigation.

The earliest symptom of *carcinoma of the cervix* is a discharge faintly tinged with blood. Vaginal smears may be used for screening but final diagnosis is made only by biopsy of the suspected lesion.

In *endometritis*, postpartum or postabortal, a low grade infection of the endometrium following delivery or abortion may produce an annoying, often foul discharge which is generally blood-tinged. The history reveals a recent pregnancy, usually with low grade fever. Examination reveals a tender, generally subinvoluted uterus.

Treatment is with antibiotics. The drug of choice is one which will inhibit a wide range of micro-organisms, such as chloromycetin, aureomycin or terramycin, 250 mg. every four hours until all symptoms subside. Curettage may be indicated if placental retention is suspected.

On rare occasions a resistant vaginal discharge may be caused by *tuberculous endometritis*. Such disease is found less frequently in the United States than in some other countries. Diagnosis is made by the demonstration of tuberculosis on endometrial biopsy. Recently a method for the culture of the organisms from vaginal secretions has been reported.[12]

Sloughing myoma or polyp is extremely rare and results in a foul, bloody discharge usually occurring after parturition or abortion. Bimanual examination and speculum visualization help make the diagnosis. Such tumors are best removed in the operating room.

Pyometria, which is often associated with cervical stricture and carcinoma of the endometrium, may cause persistent purulent discharge. Because it tends to occur in older women it may be confused with senile vaginitis. However, pyometria does not respond to estrogen therapy.

The uterus is symmetrically enlarged and soft. Treatment is by cervical dilatation and drainage, and is best performed in a hospital

so that diagnostic curettage may be done simultaneously.

In *carcinoma of the uterine body*, as in carcinoma of the cervix, the earliest symptom is discharge faintly tinged with blood. Vaginal smears obtained from the vaginal pool or by intrauterine aspiration may be used for screening, but the final diagnosis is made by curettage.

Debilitating disease requiring bedrest is often accompanied by an annoying discharge. Examination of the secretions reveals no abnormal findings. While the cause is obscure, resumption of activity results in cure.

SUMMARY

1. A clinical classification and differential diagnosis of the causes of vaginal discharge are presented to simplify the office management of leukorrhea.

2. The list of diagnoses is rapidly narrowed down by means of the history, physical examination and laboratory findings.

3. The most important single diagnostic test is the microscopic examination of the vaginal discharge in a saline drop. The wet smear will make the diagnosis in three of the most common causes of troublesome leukorrhea, namely, vaginitis due to trichomonas, monilia and senile atrophy.

4. Specific office therapy is discussed with each diagnosis.

5. A table for the differential diagnosis and therapy of leukorrhea is presented.

REFERENCES

1. Ayre, J. E. The vaginal smear. "Precancer" cell studies using a modified technique. *Am. J. Obst. & Gynec.*, 58: 1205, 1949.
2. Papanicolaou, G. N. and Traut, H. F. The demonstration of malignant cells in vaginal smears and its relation to the diagnosis of cancer of the uterus. *New York State J. Med.*, 43: 767, 1943.
3. Kranshaar, O. F., Bradbury, J. T. and Brown, W. E. The vaginal smear in population screening for uterine carcinoma. *Am. J. Obst. & Gynec.*, 58: 447, 1949.
4. Gladstone, S. A. Sponge biopsy. *Cancer*, 2: 604, 1949.
5. Gusberg, S. B. Detection of early carcinoma of the cervix; the coning biopsy. *Am. J. Obst. & Gynec.*, 57: 752, 1949.
6. Taylor, H. C., Jr. Vascular congestion and hyperemia. *Am. J. Obst. & Gynec.*, 57: 211, 637, 654, 1949.
7. Kleegman, S. J. In: Progress in Gynecology, vol. 2, p. 421. Edited by Meigs, J. V. and Sturgis, S. H. New York, 1950. Grune & Stratton, Inc.
8. Trussell, R. E. Trichomonas Vaginalis and Trichomoniasis. Springfield, Ill., 1947. Charles C Thomas, Publisher.
9. Hesseltine, H. C. Vitamin therapy in vulvar dermatoses. *Am. J. Obst. & Gynec.*, 42: 702, 1941.
10. Schauffler, G. C. Pediatric Gynecology. Chicago, 1942. Year Book Publishers, Inc.
11. Falk, H. C. Office gynecology. *Am. J. Surg.*, 39: 186, 1938.
12. Halbrecht, I. Mycobacterium tuberculosis in uterine discharge. *J. A. M. A.*, 142: 331, 1950.

THE VALUE OF PROCTOSIGMOIDOSCOPIC EXAMINATION IN THE MANAGEMENT OF INTESTINAL OBSTRUCTION*

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THE management of intestinal obstruction is often a difficult and at times a hazardous procedure. Any aid that can be given to the surgeon faced with the handling of such a case will be of value. Proctosigmoidoscopic examination is such an aid. Most surgeons are experienced in the use of the sigmoidoscope and prefer to do this examination themselves, while others prefer to call on the proctologist. Physical examination, interpretation of x-ray films correlated with the clinical findings and evaluation of the history are the present means of arriving at a diagnosis in intestinal obstruction. We are of the opinion that proctosigmoidoscopic examination is of sufficient value to be routinely performed when intestinal obstruction is considered.

It is standard practice on the surgical service of the Milwaukee County General Hospital for the proctologist to be called on all suspected cases of intestinal obstruction and to attend the deliberations incident to outlining the management of such a problem.

If the surgeon elects to have proctologic consultation, the proctologist has several things to offer which makes his consultation of value:

(1) Help in reading the scout film of the abdomen which has been taken. The modern proctologist has had training in the interpretation of x-ray studies of the colon. He sees colon x-rays every day and perhaps can add something that the surgeon may have overlooked. (Of course, the radiologist would be of still more help to the surgeon in the interpretation of the films, but it has been our experience that the majority of cases of suspected intestinal obstruction get to the hospital at night, when the radiologist is not available.)

(2) Proctosigmoidoscopic examination: If the proctosigmoidoscopic examination is negative, it will be a big help to the surgeon to know that the lower 12 inches of the bowel is free of pathologic disorder and that the obstruction is higher than the 12-inch level. Armed with the information obtained from the proctosigmoidoscopic examination the surgeon can better outline the procedure to be followed. At times the site of incision may be altered by the proctologic findings. Often the examination will give findings that will alter the management of the case considerably.

(3) An experienced opinion of the situation after examination of the patient and evaluation of the history. The proctologist is trained and experienced in the evaluation of a history relative to the bowel function.

McIver,[9] reporting on intestinal obstruction from the Massachusetts General Hospital, found that 10 per cent were due to neoplasm, 5 per cent to intussusception and 4 per cent to volvulus. All of these conditions can at times be diagnosed by proctosigmoidoscopic examination. Runyeon[14] states that 80 per cent of cancers of the bowel are in the sigmoid and rectum, and that 90 per cent of the cancers of the sigmoid and rectum are visible through the sigmoidoscope. Of the intussusception cases 75 per cent occur in children with the ileocecal junction being the common site.[17] However, Granet[5] recently reported on sigmoidorectal intussusception, and believes that it occurs quite often. We often consider a tumor or polyp when thinking of large bowel intussusception such as the sigmoidorectal intussusception due to carcinoma of the sigmoid, as reported by Salvin.[15] The incidence figures on volvulus in intestinal obstruction vary considerably. Bruusgaard[2] states that 30 to 50 per cent of intestinal obstruction in Europe is due to volvulus, while in the United States it accounts for 10 per cent of the intestinal obstructions. This is considerably higher than the 4 per cent incidence reported by McIver.[9] As we will show later, proctosigmoidoscopy can be both

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diagnostic and therapeutic in volvulus. Diverticulitis must be considered in the differential diagnosis of intestinal obstruction. Jackman and Buie in 1943[6] discussed the proctologic findings in diverticulitis and urged that proctoscopy be used as an aid in the diagnosis and differential diagnosis. The infectious granulomas which can cause obstruction can often be diagnosed by the proctoscopic picture or from the biopsy done at the time of proctoscopy. Among these would be included lymphopathia venereum, tuberculosis and schistosomiasis.[11,18] In the wide and varied field of obturation obstruction (foreign bodies, worms,[19] meconium and the like) proctoscopy may give valuable information. In infants and children with intestinal obstruction we consider such conditions as megacolon, congenital atresia of the intestine[20] and imperforate anus.[7] Often proctosigmoidoscopy is not possible or feasible, but at times it may contribute information of value to the surgeon in outlining the management of the case.

CASE REPORTS

CASE I. P. H., a seventy-five year old white man, entered the hospital on October 22, 1951, with the complaint of chest pain. A diagnosis of bilateral pneumonia was made and confirmed by x-ray. Past history was that of regular bowel movements daily, with no complaints referrable to the gastrointestinal tract. On October 24th, the patient complained of generalized abdominal pain with slight distention. There had been no bowel movements since admission. The abdominal distention gradually increased and on October 27th surgical consultation was requested for possible intestinal obstruction. The surgical consultant thought that medical management was indicated, but asked for proctologic consultation and also that a flat plate of the abdomen be taken.

X-ray was taken on October 27, 1951. Supine projection of abdomen revealed innumerable circular radiopacities present in the region of the cecum and various other portions of the abdomen representing enteric coated tablets. There was marked distention of the cecum, ascending colon, hepatic flexure and transverse colon up to the point of the splenic flexure. There were also several loops of slightly distended small bowel in the left hemiabdomen.

Impression was that a barium enema examination be done on this patient to evaluate further the site and type of bowel obstruction.

On October 27, 1951, proctologic consultation was held. Digital: sphincter tone was poor. The ampulla of the rectum was filled with semi-solid stool. The fecal impaction was broken up and the patient expelled a large amount of soft stool. Impression was bowel obstruction due to fecal impaction.

The patient was seen again by the surgical consultant on October 27th, with the following note: "Patient evacuated considerable stool while being proctoscoped. The abdomen is soft and the bowel sounds active. Impression: Fecal impaction."

The patient had no further bowel difficulties after several enemas. On checking the medications prescribed it was found that the patient was receiving ammonium chloride, gr. xxx four times a day.

Comment: In this case the proctosigmoidoscopic examination was both diagnostic and therapeutic and obviated the need for additional surgical consultation. Mullarkey[10] and Carmel[3] point out the surgical significance of fecal impaction and stress that it should always be considered in the differential diagnosis of intestinal obstruction. They both cite cases in which exploratory laparotomy was done, only to find that the intestinal obstruction was due to fecal impaction. Schwade[16] reports fecal impaction due to enteric coated pills. The finding of radiopacities in the bowel and the fact that this patient was receiving ammonium chloride in large doses leads us to believe that the medication was a factor in the production of fecal impaction.

CASE II. S. S., a seventy year old white man, entered the hospital on January 18, 1952, with the chief complaint of no bowel movement for two weeks. The patient had had constipation for the past five years, gradually becoming more severe. A barium enema examination had been done several weeks prior to admistion. There had been no pain or rectal bleeding, and in the past year the patient lost 20 pounds in weight. The patient's only illness was a peptic ulcer ten years previously, which was controlled by diet. Physical examination revealed a well developed, well nourished man, with mild respiratory distress while lying in bed; suggestive cyanosis of the lips and a warm, dry skin. The only positive findings were as follows: abdomen distended; bowel sounds

normal; no palpable masses; and an annular hard rectal stricture. Impression was bowel obstruction.

The patient was referred for proctosigmoidoscopic examination on January 18, 1952, as a questionable intestinal obstruction, and to rule out carcinoma of the rectum. Digital: hard fecal impaction, rectal stricture just above anorectal line. Impression was (1) rectal stricture; (2) fecal impaction. On January 19, 1952, under caudal anesthesia a posterior sphincterotomy was performed and the fecal impaction removed by manual extraction and lavage. Multiple scarring suggestive of postoperative scarring from previous anorectal surgery was noted, and it was believed that the stricture was a postoperative one. There was considerable language difficulty and the history as obtained from the patient was inadequate. The postoperative course was complicated by reluctance and inability of the patient to move his bowels, with multiple enemas and bulk laxatives being needed.

Comment: This case is similar to Case I in that both patients had fecal impaction. Both patients were seen by the Proctology Department as suspected intestinal obstruction cases. Case II, however, had anorectal disorder in the form of a rectal stricture that was the etiologic factor in the production of the fecal impaction. Surgery was indicated but the indicated surgery was anorectal rather than abdominal.

Case III. A. G., a seventy-four year old white woman, entered the hospital on October 24, 1951. She had had constipation requiring cathartics for the two weeks prior to admission; previously bowel habits were normal. Three days before admission crampy pain which was intermittent developed in the abdomen and gradually increased in severity. Vomiting occurred one day later and the patient was unable to retain anything by mouth, including water. The last bowel movement had been on October 20, 1951. The patient had not been passing gas, denied any diarrhea or blood in stool except for bleeding hemorrhoids years ago. There was a weight loss of 18 pounds in the past two years. Past history disclosed gallbladder surgery fifteen years ago and appendectomy twenty-five years ago. Physical findings revealed a well developed, fairly well nourished woman in obvious distress. The abdomen was distended, especially in the lower half, with diffuse tenderness; rebound activity was present in all quadrants, with no palpable masses. Bowel sounds: occasional prolonged rushes followed by no tones, then occasional faint metallic tone. Impression was bowel obstruction.

The patient was seen by Proctology Department on October 24, 1951. Sigmoidoscopy to a 25 cm. level revealed a normal mucosal pattern. There was a very small amount of tarry stool in the lumen; however, patient had been taking iron. Impression was bowel obstruction higher than 10-inch level. X-ray and barium enema were done on October 24, 1951. A Miller-Abbott tube was noted *in situ* in the cardiac portion of the stomach. There was moderate to marked distention of multiple segments of small bowel but no evidence of distention of any portions of the large bowel. Contrast visualization of the large bowel revealed the various segments of the large bowel to be normally outlined and to have a normal mucosal pattern. Impression was small bowel intestinal obstruction; normal barium enema.

On October 25, 1951, an exploratory laparotomy was performed. Diagnosis was small bowel obstruction in the ileum due to volvulus and adhesive bands. Surgery included small bowel resection and enteroenterostomy.

Comment: This case illustrates negative proctosigmoidoscopic findings which, combined with the x-ray findings and the history of previous abdominal surgery, made the surgeon fairly certain he would find a small bowel obstruction, probably due to adhesions. We believe that the surgeon was supported by the positive knowledge that there was no lower bowel disorder, and the decision to perform an exploratory laparotomy was more readily made. Of 368 cases of intestinal obstruction reported by Flesch-Thebesius[4] 44 per cent were due to adhesive bands.

Case IV. A. P., a forty-seven year old white woman, entered the hospital on February 3, 1952, with the chief complaint of diarrhea of five weeks' duration. After a complete work-up a diagnosis of ulcerative colitis was established. The patient failed to make progress on routine supportive treatment and ran a toxic course. Medical ileostomy was instituted but the patient continued to make no response to treatment. She was still passing eight to ten watery, bloody stools per day and appeared toxic. At this time there was transient abdominal distention. On February 23rd ACTH

therapy, 15 units every six hours, was started. On February 26th, the patient felt a little better but was still having six to seven watery stools a day; the abdominal distention had increased and pitting edema of the extremities was present. With the increasing distention an intestinal obstruction was considered and repeat proctoscopy requested. The patient was seen by the Proctology Department on February 27th, and the sigmoidoscope was passed to a 30-cm level. The mucosa was typical of ulcerative colitis with ulceration and pseudopolyp formation. The bowel lumen was adequate or enlarged to this level, and no point of obstruction could be found. On February 27th, x-ray examinations of the abdomen (taken before proctosigmoidoscopy) showed gas in the cecum, transverse colon and sigmoid region, with marked distention. There were several segments of small bowel that were somewhat dilated on the basis of incompetent ileocecal valve. Barium was present in the cecum due to previous barium enema. Impression was adynamic large bowel. Barium enema (after proctoscopy): After rectal administration of a thin barium suspension the sigmoid and ascending, transverse and descending colon, as well as the cecum, were outlined. The sigmoid, transverse colon, descending colon and cecum were markedly dilated, but there was no evidence of obstruction at any point in the large bowel. Impression was adynamic ileus of the large bowel with incompetence of ileocecal valve and gas in the small intestine. On March 4, 1952, surgery was performed. Upon opening the peritoneal cavity a large amount of fibrinopurulent fluid was found. A pinpoint perforation of the cecum was found and closed by means of interrupted Dulox suture. Ileostomy was done.

Comment: Here again the proctosigmoidoscopic examination was negative as far as findings of intestinal obstruction was concerned. The flat plate of the abdomen taken before the proctosigmoidoscopic examination was suggestive of an intestinal obstruction in the region of the sigmoid, and only after conference with the Proctology Department was the diagnosis of adynamic ileus of the large bowel made. The barium enema on February 27th was done to substantiate the adynamic ileus diagnosis. We do not believe that the ACTH therapy was a factor in the production of the adynamic bowel. The distention was noted before the ACTH was started, and it is believed that the ileus was secondary to the perforation noted in the cecum. According to Bargen[1] the three common causes of perforating lesions of the large intestine are: (1) diverticulitis; (2) carcinoma and (3) ulcerative colitis. Before the fact of an adynamic ileus was established a stenosing lesion secondary to the ulcerative colitis was considered. Marshak, Lester and Friedman[8] have reported megacolon as a complication of ulcerative colitis and give several illustrative cases. In this case the proctosigmoidscopy perhaps was of more help to the radiologist than to the surgeon.

Case v. J. K., a seventy-five year old white man, entered the hospital on October 12, 1951, with the entering complaint of diarrhea and vomiting. He had been dismissed from the hospital two weeks before after complete work-up that was essentially negative other than a barium enema impression of diverticulosis of the sigmoid. The diarrhea was of five days' duration with six to eight light brown stools per day. He had pain in left lower quadrant and vomiting, but had no blood in stools. The abdomen showed some gaseous distention. There was tenderness and some rigidity localized to left lower quadrant. No palpable masses were present; normal to hyperactive bowel sounds. Impression was acute enteritis and diverticulitis.

Progress notes: (October 13, 1951) The patient had had one bowel movement since admission, which was diarrheal. Singultus continued but there had been no vomiting since admission. (October 15, 1951) Distention was noted. The patient had had no bowel movement since October 13th. Bowel sounds were practically absent. Emesis occurred that morning. At surgical consultation the impression was complete large bowel obstruction in the rectosigmoid, with reflux into small bowel. (A previous barium enema on September 27, 1951, had revealed diverticulosis of the sigmoid.) X-ray of the abdomen showed gas, with moderate distention in the region of the sigmoid, descending colon, transverse colon, ascending colon and cecum. There was also some gas in portions of the ileum, with moderate distention. Impression was that the aforedescribed findings represented a large bowel

intestinal obstruction with a reflux of gas into the small bowel. The site of obstruction was in the sigmoid colon.

Proctologic consultation was held on October 15, 1951. Digital: The prostate was large and firm, tone normal. At the tip of the finger anteriorly there was a resistance which felt like an extra rectal mass, but was too high to evaluate. Sigmoid: At a 5-inch level two small diverticula were seen on the posterior wall and inspissated stool was expressed. At 5½ inches a large diverticulum was seen to contain purulent material. The rectal ampulla was full of foul-smelling mucopurulent material. Impression was diverticulitis, with abscess. Surgery was suggested.

That evening a transverse colostomy was performed. No attempt was made to explore the abdomen. The patient's course was downhill and he expired on October 23, 1952.

Comment: The previous admission with an x-ray diagnosis of diverticulosis gave the diagnostic team an advantage in determining the etiologic factor in this intestinal obstruction. The findings on proctosigmoidoscopic examination of diverticula and mucopurulent material in the ampulla helped to substantiate the diagnosis of diverticulitis. Mindful of the fact that diverticulitis can be complicated by carcinoma, as recently reported by Rowe and Kollmar,[13] the surgeon was given assurance when the proctosigmoidoscopic examination was reported to him. He could now plan a two-stage procedure with no time limit as to when the second stage should be done. Unfortunately, the patient did not survive the emergency procedure.

Case VI. P. A., a seventy-two year old white man with diabetes, entered the hospital on September 20, 1951, with a complaint of no bowel movement for three days and progressive swelling of the abdomen. Pain was minor and the patient had been unable to pass gas. He vomited three times a day before admission but there was no emesis on the day of admission. The patient had a similar episode in May, 1951. A diagnosis of volvulus of the sigmoid was made. Exploratory laparotomy was done, with surgical reduction of volvulus. Past history disclosed appendectomy had been performed in 1920. Physical examination revealed a well developed, well nourished man in no distress. The abdomen was greatly distended, tympanitic and non-tender, and borborygmi were present. Impression was intestinal obstruction due to recurrent volvulus.

The patient was seen by the Proctology Department on September 20, 1951. He was sigmoidoscoped to a 10-inch level. A colon tube was threaded through the scope and a large amount of gas and liquid feces were expelled; tube was taped into place.

X-ray of the abdomen on September 21, 1951, showed several loops of markedly distended large bowel present in the regions of the cecum and transverse colon. There was a moderately distended loop of large bowel representing the descending colon. A radiopaque tube was present, extending from the region of the rectum into the sigmoid colon, revealing a marked redundancy of the sigmoid colon.

Impression was that these findings represented a large bowel obstruction. In view of the patient's previously proven findings of volvulus of the sigmoid colon this must be considered as a possibility of being the etiologic factor at this time.

From September 20th until the 28th, the patient was fine, with a soft abdomen and no vomiting. He had daily bowel movements until September 28th, when distention recurred. He was seen again by the Proctology Department on September 29th. Complete examination was repeated, and at a 10-inch level there was an area of discoloration of the mucosa (hyperemic and dark red). The colon tube was passed beyond the end of the scope and a large amount of flatus and liquid feces were passed.

On September 28th, x-ray, flat plate and left lateral decubitus projections of the abdomen showed marked distention of various segments of the large bowel, predominantly in the region of the sigmoid colon, which revealed a large, circular type of configuration. No definite evidence of gas in the small bowel was visualized.

Impression was that these findings represented a large bowel obstruction secondary to a volvulus of the sigmoid colon.

The patient remained free of distention. Elective resection was decided upon and the patient was prepared with transfusions and bowel preparation (aureomycin). On October 2, 1951, anterior resection of the sigmoid with end-to-end anastomosis was done; 45 cm. of sigmoid colon was removed.

CASE VII. H. N., a fifty-five year old Negro, entered the hospital on October 21, 1951. He had been transferred from the Hospital for Mental Diseases, where he had been hospitalized for paresis. The patient was disoriented and no history was available. Physical examination revealed a well developed and well nourished man. His abdomen was markedly distended, with hyperactive peristalsis. Audible rushes were heard; peristaltic sounds were very high pitched and tinkling in character. The veins over the lower and upper abdomen were distended. Impression was bowel obstruction.

The patient was seen by the Proctology Department on October 21, 1951. Digital: The prostate was small, poor tone. Just above the prostate there was a soft, fluctuant, edematous area, possibly due to extrarectal pressure. Sigmoid: To 12 inches, mucosa was pale but otherwise normal. Impression was: (1) volvulus; (2) neurogenic ileus. Barium enema was suggested. Colon tube was inserted through sigmoidoscope.

Supine and upright x-rays of the abdomen on October 21, 1951, (before proctoscopy) revealed marked distention of the entire large bowel. There was a hairpin turn present in the region of the sigmoid colon, which was also markedly distended. No evidence of gas in any of the segments of small bowel was seen.

Impression was that these findings represent a complete large bowel intestinal obstruction, and the configuration of the sigmoid colon is most consistent with a volvulus as the etiology of the obstruction.

Barium enema was done on October 21, 1951 (after proctoscopy). Contrast visualization revealed a marked redundancy of the sigmoid colon, which was noted to extend up to the level of the first lumbar vertebra and then coil upon itself and extend down into the pelvis, making a turn in this region and extending upward as the descending colon and splenic flexure. Impression was volvulus of the sigmoid.

Progress notes: (October 21, 1951, 2:30 P.M.) Patient greatly improved following deflation by Proctology Department. (October 21, 1951, 8:00 P.M.) Patient was afebrile. X-rays prior to proctoscopy showed dilatation of the large bowel. That night abdomen was soft and non-tender; bowel sounds were present. X-ray was made on October 23, 1951, (flat plate and upright projections).

Impression was that these findings represent reduction of the previously described large bowel obstruction, secondary to volvulus of the sigmoid colon.

The patient was given multiple blood transfusions and electrolyte balance restored. After adequate bowel preparations an anterior resection of the sigmoid with end-to-end anatomosis was done on November 21st.

Comment: In these two cases the proctosigmoidoscopic examination again was both diagnostic and therapeutic. Decompression of a volvulus is discussed very completely by Bruusgaard.[2] We have found it to be a very valuable procedure. Often an abdominal emergency, as herein illustrated, can be converted into an elective procedure. This allows for adequate preparation of the patient by restoring electrolyte balance, preparing of the bowel for colon surgery and, if indicated, building up the blood to normal levels. The surgery when done is not as hazardous, and the patient's postoperative course is much easier.

CASE VIII. A. W., a seventy-three year old white man, entered the hospital on February 7, 1952, with the chief complaint of vomiting of three days' duration, with pain in the abdomen. For two weeks prior to admission the patient had had no bowel movements and during the preceding year had had to take one to two laxative pills a week. One week before admission the patient had a sudden onset of colicky pain in the left upper quadrant, with generalized abdominal pain. He first noticed swelling of the abdomen eight days before admission. Prior to this he had had regular bowel movements once or twice a day. He had noticed slight rectal bleeding. There was no pain associated with bowel movement and no previous bowel difficulties. The patient had not lost weight. Physical examination revealed a well developed, well nourished man in moderate distress. The abdomen was distended and obese, with no masses. The kidney, liver and spleen were not palpable. Bowel sounds were hyperactive and high pitched and there was generalized tenderness. Impression was: large and small bowel obstruction, etiology unknown.

The patient was seen by the Proctology Department on February 8, 1952. Sigmoid: To 25 cm. level; at 5 inches on anterior wall there was a sessile 1 by 1 by 0.5 cm. polyp, and a second 3 mm. sessile polyp. Bloody stool was present in the bowel lumen at 25 cm. level. Impression: (1) rectal polyps, two; (2) possible

obstructing lesion just above level of scope (carcinoma). Barium enema was advised and larger polyp biopsied. Examination should be repeated with longer sigmoidoscope.

X-ray of the abdomen on February 7, 1952 showed many loops of dilated small bowel. There was a segment of large bowel that was dilated, extending from the cecum to the splenic flexure. No gas was present along the descending colon or rectum. Impression was large bowel obstruction.

Barium enema was done on February 9, 1952. After the retrograde instillation of a thin barium suspension the barium outlined the rectum and lower portion of the sigmoid. In the sigmoid the barium made an abrupt stop, and a small trickle of barium was seen to pass through a stenosing lesion. The proximal portion of the sigmoid showed overhanging edges and the defect measured approximately 4 inches in length. The remaining bowel was not outlined. Impression was annular constricting carcinoma of the sigmoid.

The patient was seen again by the Proctology Department on February 9, 1952. Re-examination was done with a 12-inch scope which was passed to a 30 cm. level. At 30 cm. there was an ulcerated annular lesion; biopsy was taken.

Pathologic report: Biopsy of bowel polyp showed development of adenocarcinoma; biopsy of annular lesions also showed adenocarcinoma.

On February 11, 1952, cecostomy was done. No attempt was made to explore the abdomen. Postoperative course was satisfactory other than elevated non-protein nitrogen. Electrolyte balance was restored. On February 17, 1952, while eating lunch, the patient became nauseated, vomited, had difficulty breathing and expired. Diagnosis was coronary occlusion.

Comment: Often, when the intestinal obstruction is due to a carcinoma, the obstructing lesion can be felt on digital examination. In this instance the lesion could not be felt. Although the original examination did not reach the level of the obstructing lesion, the finding of multiple polyps and bloody mucous in the bowel lumen was presumptive of carcinoma. The biopsy of the larger polyp showed adenocarcinoma. Rankin and Conger[12] have stressed the possibility of multiple carcinomas of the colon. By obtaining a biopsy of the obstructing lesion the correct diagnosis was established. Although the proctosigmoidoscopic examination often does not alter the need for emergency surgery, it usually establishes the diagnosis. With a positive diagnosis it might give the surgeon time to prepare his patient properly and thus reduce the likelihood of postoperative complications. Knowing with what he is dealing the surgeon is better prepared to meet the situation adequately.

SUMMARY

Any aid that can be given to the surgeon faced with the problem of intestinal obstruction is of value. The proctosigmoidoscopic examination is such an aid. A proctosigmoidoscopic examination should be a regular part of the work-up when intestinal obstruction is suspected, as it has diagnostic and often therapeutic value. Several illustrative cases are presented to support this contention.

REFERENCES

1. Bargen, J. A. and Cox, F. W. Perforating lesions of the large intestine. *Minnesota Med.*, 15: 466, 1932.
2. Bruusgaard, C. Volvulus of the sigmoid. *Surgery*, 22: 446, 1947.
3. Carmel, A. G. Fecal impaction—report of ten cases. *Cincinnati J. Med.*, 17: 448, 1936.
4. Flesch-Thebesius. Cited by Wangensteen.[17] Intestinal Obstructions, 2nd ed., p. 347.
5. Granet, E. Sigmoido-rectal intussusception and the unstable colon. *Am. J. Digest. Dis.*, 19: 32, 1952.
6. Jackman, R. J. and Buie, L. A. Diverticula of the colon. *J. A. M. A.*, 121: 1144, 1943.
7. Ladd, W. E. and Gross, R. E. Congenital malformations of the anus and rectum. *Am. J. Surg.*, 23: 167, 1934.
8. Marshak, R. H., Lester, L. J. and Friedman, A. J. Megacolon; a complication of ulcerative colitis. *Gastroenterol.*, 16: 768, 1950.
9. McIver, M. A. Acute intestinal obstruction. *Am. J. Surg.*, 19: 177, 1933.
10. Mullarkey, R. E. Surgical significance of fecal impaction. *Northwest. Med.*, 40: 118, 1941.
11. Mustacchi, P. O. and El Sebai, T. Advanced schistosomal proctitis clinically resembling cancer of the rectum. *Gastroenterol.*, 19: 137, 1951.
12. Rankin, F. W. and Conger, A. B., Jr. Metachronous carcinomas of the colon. *J. A. M. A.*, 146: 918, 1951.
13. Rowe, R. J. and Kollmar, G. H. Diverticulitis of the colon. *Surg., Gynec. & Obst. (abstr.)*, 94: 1, 1952.
14. Runyeon, F. G. Sigmoidoscopy: Its clinical importance to the practitioner. *J. A. M. A.*, 147: 913, 1951.

15. Salvin, A. A. Sigmoidorectal intussusception due to carcinoma of the sigmoid. *Am. J. Surg.*, 31: 367, 1936.
16. Schwade, L. J. Enteric coated pills as a cause of fecal impaction. *Am. J. Surg.*, 79: 184, 1950.
17. Wangensteen, O. H. Intestinal Obstructions, 2nd ed., p. 396. Springfield, Ill., 1949. Charles C Thomas.
18. Warner, B. W. Anorectal and colonic manifestations of schistosoma mansoni infestation. *Am. J. Surg.*, 57: 168, 1942.
19. Watson, F. C. Intestinal obstruction due to the ascaris lumbricoids. *Ann. Surg.*, 71: 757, 1920.
20. Webb, C. H. and Wangensteen, O. H. Congenital Intestinal Atresia. *Am. J. Dis. Child.*, 41: 262, 1931.

Statistics show that splenectomy is very valuable in the therapy of congenital hemolytic jaundice and in thrombocytopenic purpura. These are known as definite instances of primary hypersplenism; however, so is congestive splenomegaly, yet splenectomy does not always give favorable results in such cases. According to recent studies at the Mayo Clinic by Miller and Hagedorn, splenectomy is also useful in many selected cases of secondary hypersplenism, such as acquired primary hemolytic anemia, as well as for special instances of splenomegaly. However, careful bone marrow studies should precede any such operation. In performing splenectomy careful exploration should also be done because often accessory spleens are present and these must be removed; otherwise the postoperative results will be unsatisfactory. (*Richard A. Leonardo, M.D.*)

CARCINOID OF THE RECTUM*

A REPORT OF THREE CASES

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UNTIL the past decade carcinoid of the rectum has been a relatively rare pathologic lesion. Since this time, however, a progressive awareness of carcinoids of the rectum as a frequently unsuspected but potentially malignant lesion has been demonstrated in various case reports. The total number of reported cases now numbers sixty. With more frequent examination of excised rectal tissue and recognition by pathologists of the peculiar architecture of carcinoids, we believe we will have an increased incidence of the lesion.

There has been considerable confusion concerning the nomenclature of these tumors. The same pathologic entity that by 1907[3] was christened a carcinoid of Oberndorfer is also known as a neurocrine tumor and an argentaffinoma, the latter despite the fact that, when located in the rectum, the granules do not show the same proclivity to stain deeply with silver salts as do the same tumors when located in other portions of the gastrointestinal tract. It is agreed generally, though, that carcinoids arise from the chromaffin system of the intestinal mucosa.

Horn in 1949[4] found, in a study of fifty-six cases of carcinoids of the rectum, five in which distant lymphatic or hematogenous metastases were present at the time of the initial examination. The primary focus in the rectum had been asymptomatic. Rosser in 1951[6] reported another case of metastatic disease from a silent focus in the rectum. It may be assumed that approximately 10 per cent of the cases of carcinoid of the rectum will continue to infiltrate or metastasize and to all purposes conduct themselves like an adenomatous carcinoma of the rectum, although it takes a far greater period of time for the disease to run its course, as patients have been known to live for years in the presence of abdominal metastases. These slowly lethal characteristics of the carcinoids have led Brunschwig,[1] Stout,[8] and Erlich and Hunter[2] to believe that local removal was the procedure of choice. Shepard[7] and Strug believe that since carcinoid in this location may show the same invasive and metastasizing characteristics as other slowly growing malignancies, a more aggressive approach should be made to the problem. We have not found any case in which a deliberate abdominal-perineal resection was performed, although several have been reported when the biopsies erroneously were reported as carcinoma rather than carcinoid.[7]

The difficulty in determining the type of treatment is to no small extent due to the pathologist's inability to determine on section just which lesions will metastasize and which will not. Thus it falls to the surgeon to exercise a constant vigilance over patients who have had carcinoids removed and check indefinitely with a proctoscope and barium air studies for recurrences.

Pearson and Fitzgerald[5] have described the characteristics of carcinoid of the rectum. The tumor generally originates as a small submucosal nodule which slowly increases in size and eventually may present itself as a pedunculated or sessile polyp. This later may develop into a fungating or stenosing lesion of the rectum with ulceration. One of the commonest attributes of these carcinoids, however, is that they retain an intact mucous membrane in the earlier stages.

The small submucosal nodule, unless obvious metastases are present, should be completely removed, preferably with electrocoagulating snare technic.

The treatment of this lesion differs in no way from that of any polyp of the rectum which can be removed by inclusion within an electric snare. It has been our conviction that biopsy of a polypoid lesion of this size is unjustified. The initial treatment should be the definitive

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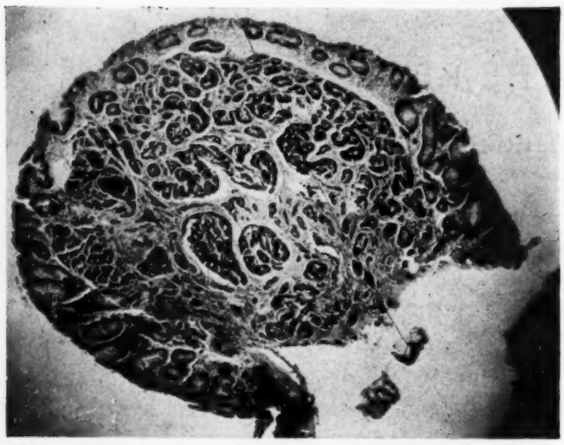


FIG. 1. Low power photomicrograph showing characteristic arrangement of the groups of neoplastic cells. In this tumor there is an attempt at acinus formation. The mucosa is invaded but not ulcerated. Carcinoid cells extend to the line of amputation.

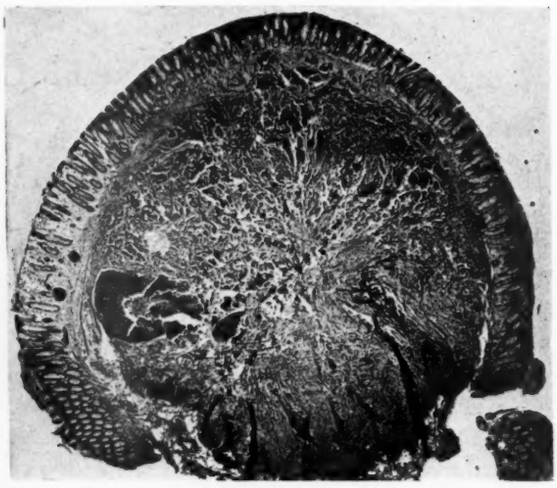


FIG. 2. Low power photomicrograph showing pedunculated carcinoid polyp. The mucosa is stretched over tumor mass but not invaded by it.

treatment. This means complete and thorough removal. The entire specimen is considered as the biopsy material.

Three additional cases of carcinoid of the rectum, all of which have been diagnosed postoperatively during the past year at St. Luke's Hospital, New York City, are reported herein.

CASE REPORTS

CASE 1. A sixty-five year old white man presented himself for examination with a complaint of bleeding from the rectum of one year's duration. At physical examination abnormal findings were confined to the rectum and anus. The patient had prolapsing, ulcerated hemorrhoids, grade III, on the basis of grade IV as the most severe. In addition to severe hemorrhoids proctoscopic examination revealed a small polyp of the rectum measuring 0.5 cm. in diameter with a short pedicle. This was not ulcerated and was covered with smooth mucosa. A barium enema with air contrast was reported as negative for other lesions.

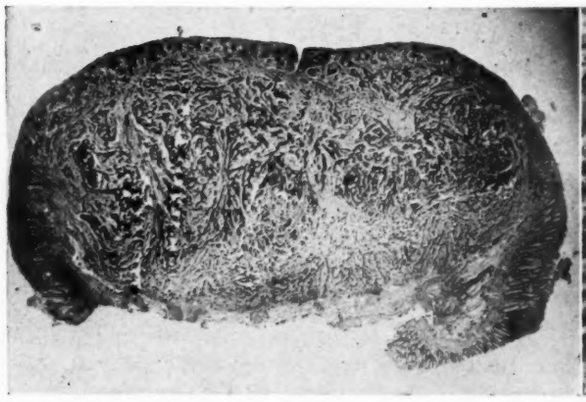
The polyp described was removed with the electrocoagulating snare and the base further coagulated. A hemorrhoidectomy was then performed with sharp dissection of external hemorrhoids, application of clamp to internal hemorrhoidal tissue. A suture ligature was applied around the apex of the mucosa at the tip of the clamp to control hemorrhage, after which the hemorrhoidal tissue held in the clamp was cauterized. Three areas were so treated.

When the clamp was removed from the third area, a small 0.25 cm. elevation of the mucous membrane at the apex of the area removed was noted. This was not ulcerated and lay 0.5 cm. above the site of the hemorrhoidal excision. No major significance was attached to this finding. The supposed polyp was grasped with a tooth forceps, elevated, and a small straight clamp placed across the base of the elevated mucosa. The mass was removed and a fine catgut suture was applied to control bleeding. Three specimens, hemorrhoids and two polyps were labeled and sent to be examined. The patient's convalescence was uneventful.

Pathologic reports of the tissue showed the first polyp removed to be an adenomatous polyp. The last specimen removed proved to be a carcinoid tumor of the rectum. (Fig. 1.) Pathologic tissue was found at one cut edge of this specimen. Further excision was indicated.

A second operation was performed twelve days after the first procedure. An area which was the site of the carcinoid was widely excised but the pathologic report failed to show any tumor on section.

Periodic examinations every three months were carried out, with no evidence of recurrence. Ten months later a routine examination was made. An area of induration was found running longitudinally upward from the mucocutaneous line for a distance of 2 cm. which was studded with hard nodules about 1 mm. in diameter. This area was not the site of the original tumor but lay along an edge of the area excised at the second operation. The



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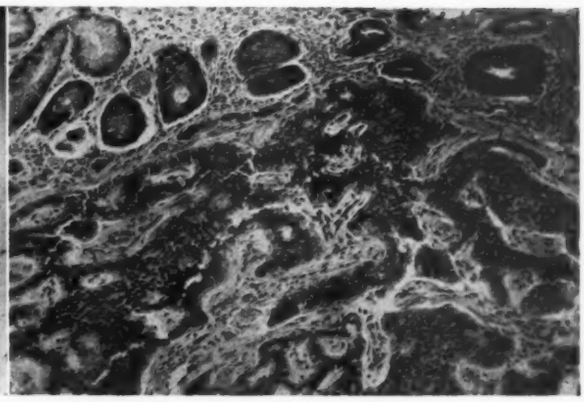

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FIG. 3. Low power photomicrograph showing sessile carcinoid polyp. Neoplastic elements grow into but do not destroy the mucosa, and also are seen at the line of amputation.

FIG. 4. High power photomicrograph showing masses and anastomosing cords of uniform polygonal cells with round, vesicular nuclei. There is little gland formation. Separating these cords and masses is a moderately abundant supporting stroma composed of smooth muscle and collagenous tissue. The smooth muscle is disrupted muscularis mucosa.

following day this area was removed. Pathologic examination did not show any tumor but did show a foreign body reaction in each of the nodules. The patient's convalescence was uneventful.

CASE II. A fifty-four year old white man presented himself for examination with a complaint of indefinite, vague rectal pains of mild severity of three weeks' duration. There had been slight bleeding from the rectum with bowel movements for several years.

Proctoscopic examination showed a small 0.5 cm. lesion resembling a polyp with a pedicle at 11 cm. from the anal outlet. Carcinoid of the rectum was considered as a diagnosis.

The lesion was removed with the electrocoagulating snare. The mucous membrane at the base was loose and, with funnel tip suction, the lesion was pulled through the snare to insure adequate removal. Pathologic report was carcinoid of the rectum. (Fig. 2.)

Air contrast barium enema two weeks after removal of the lesion showed another lesion, resembling a polyp, located in the sigmoid colon. A second series of x-rays will be taken soon. If this lesion can be redemonstrated in the same area, colotomy with local excision will be advised.

CASE III. A thirty-eight year old white woman presented herself for examination with a chief complaint of a sore, discharging right nipple of two months' duration and an incidental complaint of occasional bleeding from the rectum which accompanied bouts of constipation.

At physical examination the abnormal findings were confined to the right breast and the rectum. There was a 3 cm. area of crusted excoriation on the right nipple but no tumor was palpable in the deeper area of the breast. In the rectum there were a few skin tabs but no internal hemorrhoids. At a distance of 4 cm. from the anal outlet there was a sessile polyp which measured one cm. in diameter. No additional pathologic disorder could be demonstrated in the remainder of the large bowel.

Under general anesthesia a generous and deep biopsy was taken of the right nipple and breast. Pathologic report on this tissue was simple inflammation of the nipple and productive, chronic mastitis of the breast tissue proper. Two days later, without anesthesia, the polyp in the rectum was removed with the electric snare. At this time the polyp appeared hemorrhagic but there was no ulceration or induration of the base. (Figs. 3 and 4.) Follow-up examination ten months after this procedure did not show any abnormal findings despite the fact that pathologic examination demonstrated neoplastic elements at the site of the amputation of the polyp.

SUMMARY

1. Three cases of carcinoid of rectum are reported.

2. All small lesions of rectum should be completely removed and entire specimen considered biopsy material.

3. Periodic examinations of patients from whom carcinoid tumors have been removed are indicated and should include barium enema with air contrast.

4. All tissue removed from anus and rectum should be subjected to pathologic examination to insure proper diagnosis and subsequent treatment.

5. Carcinoid of the rectum must be considered in any pathologic report of a rectal lesion showing intact mucous membrane with underlying tumor tissue suggesting carcinoma of rectum. A correct evaluation of the lesion may avoid unnecessary resection of the rectum.

REFERENCES

1. Brunschwig, A. Argentaffin tumors (carcinoids) of the rectal colon. *J. A. M. A.*, 100: 1171, 1933.
2. Ehrlich, J. C. and Hunter, O. B. Tumors of the gastrointestinal tract; A survey of 813 in persons of military age during World War II. *Surg., Gynec. & Obst.*, 85: 98, 1947.
3. Ewing, J. Neoplastic Diseases, a Treatise on Tumors, 4th ed. Philadelphia and London, 1940. W. B. Saunders.
4. Horn, R. C., Jr. Carcinoid tumors of the colon and rectum. *Cancer*, 2: 816, 1949.
5. Pearson, C. and Fitzgerald, P. J. Carcinoid tumors of the rectum. *Ann. Surg.*, 128: 128, 1948.
6. Rosser, C. Carcinoid tumors of the rectum. *Surg., Gynec. & Obst.*, 93: 486, 1951.
7. Shepard, R. M., Jr. and Lilio, J. H. Carcinoid tumors of the rectum. *Surgery*, 29: 205, 1951.
8. Stout, A. P. Carcinoid tumors of the rectum derived from Erspamer's pre-enterochrome cells. *Am. J. Path.*, 18: 993, 1942.

MESENTERIC VASCULAR OCCLUSION

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THE present review offers, besides a fair cross section of the newer concepts on the subject of mesenteric vascular occlusion, a division of the clinical syndromes of the disease into three types, acute, subacute and fulminating; an anatomic disproval of the widely accepted view that primary sclerosis is a cause of mesenteric thrombosis; a presentation of twelve cases in tabular form; and case histories of three patients successfully treated.

A comprehensive perusal of the literature reveals a renewed interest in the serious problems embodied in this complex disease, an interest stirred up principally by a vastly improved prognosis.[1] Noteworthy, too, is the rather general acceptance of the term mesenteric vascular occlusion as the generic name of this entity. This term would displace such minor and restricted terms as mesenteric venous thrombosis, mesenteric arterial thrombosis and mesenteric embolism.[2–4] These latter subtitles should be reserved to supplement the final (complete) diagnosis. The need for a generic term became quite obvious since (1) the clinical differentiation of arterial and venous thrombosis is practically impossible, (2) the same situation exists regarding embolic and thrombotic processes, (3) such decisions at operation are often very questionable and (4) at times the pathologist is at a loss to decide whether the arteries or the veins were first occluded[5–7] Also, despite notable clarification of some related problems, much widespread confusion is still encountered regarding the nature of mesenteric vascular occlusion including its pathogensis, diagnosis and treatment. In plain fact, the scientific approach to these problems has hardly begun.

Classification. For purposes of orientation the disease may be tabulated as follows:

MESENTERIC VASCULAR OCCLUSION

1. Primary or non-strangulation group:
   - A. Arterial
     - Embolic
     - Thrombotic
   - B. Venous thrombotic
2. Secondary or strangulation group.

In this communication remarks will refer only to the primary or non-strangulation group since the secondary group of occlusions are but complications of other entities such as intussusception, volvulus and strangulated hernia.

Etiology. Mesenteric vascular occlusion occurs in all age groups but particularly in the span between thirty and sixty years. Males are afflicted about three times as often as females. Among the principal causes may be numbered cardiac and aortic vegetations, cardiac fibrillation, necrotic lung processes, blood dyscrasias, altered hemodynamics and trauma.[11–13] Mesenteric venous thrombosis usually stems from intra-abdominal infections and portal stasis, while both venous and arterial obstructions have resulted from direct blows to the abdomen and from operative procedures in non-infected as well as infected cases.[2,14,15]

A point of special interest in etiology is the existence or not of primary sclerosis of the mesenteric vasculature. This condition has often been mentioned as a cause of the primary type of mesenteric thrombosis.[8,11,16] A painstaking review of the literature failed to reveal evidences of a direct (objective) approach to this problem from any source.[1,4,9,11,17,20] For purposes of clarity it is repeated that the reference is to primary vascular sclerosis of the mesenteric vessels. There seems to be adequate evidence of mesenteric venous and arterial sclerosis associated with chronic visceral diseases such as regional ileitis and hepatitis. However, meticulous investigation at last leads to the conclusion that the only proven primary angiopathy causing obstruction in the mesenteric vessels is periarteritis nodosa, and it is to be specifically noted that this is a form of vascular disease that differs in all essentials from the ordinary types of vascular scleroses.[11,12,21,22] An instance of occlusion by periarteritis nodosa is among the twelve presented with this report.

In the attempt to discover primary sclerosis of the vessels in the mesenteric bed a thorough exploration of the mesenteric vessels was conducted in over fifty specially selected

autopsy specimens; findings in fifty of the studies are tabulated and shown in Table 1. The selection of cases for this study was based on gross evidence of advanced vascular lesions and vascular complications.

TABLE 1
TABULATION OF FIFTY AUTOPSIES FOR EVIDENCES OF ANGIOPATHY OF THE MESENTERIC VESSELS*

No. of Case	Age and Sex	Aorta	Coronaries	Renals	Origin of Superior Mesenteric Artery†	Other Mesenteric Vessels
1	30, M	0	0	0	0	0
2	70, M	4	4	3	0–1	0
3	88, F	4	3	3	0–1	0
4	77, F	4	4	3	0–1	0
5	62, M	4	4	3	2	0
6	71, M	4	3	3	1	0
7	54, M	2	4	2	2	0
8	56, M	4	4	3	0–1	0
9	78, F	4	4	3	0	0
10	39, F	3	1	0	0	0
11	70, F	4	3	3	0	0
12	80, F	3	3	2	0	0
13	70, M	3	4	2	2	0
14	57, M	1	0	0	0	0
15	47, M	1	1	0	0	0
16	75, F	1	1	1	1	0
17	58, M	4	3	3	0–1	0
18	78, M	4	3	3	0	0
19	68, F	3	3	1	1	0
20	81, M	3	3	3	0	0
21	76, M	3	4	3	1	0
22	63, M	4	3	2	0	0
23	69, M	3	3	2	0–1	0
24	66, M	2	1	1	1	0
25	65, M	4	3	3	0–1	0
26	76, M	4	3	3	0–1	0
27	72, M	4	3	3	0–1	0
28	55, M	2	1	1	1	0
29	80, M	3	2	2	0–1	0
30	57, M	1	0–1	0	0	0
31	77, F	4	3	3	0	0
32	74, M	3	2	3	0–1	0
33	60, M	2	1	1	0	0
34	64, M	4	4	4	0–1	0
35	66, F	4	4	4	0–1	0
36	62, M	4	4	3	0–1	0
37	61, M	1	1	0	0	0
38	64, M	3	4	2	0–1	0
39	77, M	3	3	3	0–1	0
40	72, M	4	3	3	0–1	0
41	53, M	3	3	3	0	0
42	69, M	3	3	0–1	0	0
43	76, F	4	3	3	0–1	0
44	83, M	3	3	1	1	0
45	54, F	4	4	3	2	0
46	51, M	1	1	1	0	0
47	59, M	3	3	3	0–1	0
48	72, M	4	3	3	0–1	0
49	86, M	4	3	3	0–1	0
50	82, M	4	3	3	0–1	0

* Code of sclerosis: 0 = none; 1 = slight; 2 = moderate; 3 = advanced; 4 = marked.
† Origin of superior mesenteric artery is the first 1 or 2 cm. of that vessel.

Table 1 reveals that in not one of the special cases was there gross evidence of vascular sclerosis of the mesenteric vessels beyond the short origin of the superior mesenteric artery. These findings take on added significance when one considers the marked degree of sclerosis found in the other systems and the advanced ages in the cases recorded, 90 per cent over fifty and 50 per cent over seventy years of age. Subsequent autopsies yielded results similar to those in Table 1.

Pathology. In the vast majority of instances of mesenteric vascular occlusion the resulting disorder is hemorrhagic infarction of the involved bowel and its mesentery and with its lumen full of dark bloody contents. A small number of ischemic infarcts have been reported.[2,4,6] It is probable that many arterial occlusions initiate anemic infarcts that later become hemorrhagic in character. In some cases as early as eighteen hours after the onset of acute symptoms a blue-black gangrene may be found, while in others this finding comes on much later. At times in the early stages of some infarctions it is quite possible that the visceral tissues may exhibit only a reddish inflammatory hue, making an accurate evaluation of the underlying condition extremely difficult and constituting thereby a serious surgical pitfall.[2]

Besides the time factor, the pathologic condition present at any phase of the disease will also be influenced by the mode of onset and the type of occlusion; the onset may be sudden or gradual and the type may be arterial or venous. That an acute onset will produce more changes in less time than an insidious one is readily understandable, but the question of whether the arterial or the venous is more acute is still unsolved. It seems, though, that the consensus is now swinging toward the venous type and this opinion based on clinical and experimental data may be correct.[7,23,24]

Figure 1 taken from Laufman and Method manifests the difference between arterial and venous occlusion during controlled animal experimentation.[23]

From the surgical aspect the following observations are of special import: Ordinarily about 3 to 9 feet of ileum or of ileum and jejunum will be found infarcted, and in most instances in which the distal ileum is involved the terminal 4 to 14 inches will be free of involvement due to a variable blood supply.[9,25,32] Further, an occlusion distal to the last arcuates may cause a small infarction (1 to 3 inches) that may recover spontaneously while, on the other extreme, an obstruction of the main stem of the superior mesenteric would involve

practically the entire small bowel plus the colon up to the splenic flexure. Also, there is the possibility that venous occlusions of the left colon may escape gangrenosis via the hemorrhoidals.[3,11,12]

Symptoms. In a full blown mesenteric vascular occlusion the clinical picture is a variable composite of intestinal obstruction and internal hemorrhage, with the obstructive features usually predominating. From personal study of cases and from a critical review of numerous accounts, it is deemed necessary to divide the disease into three clinical types: acute, subacute and fulminating. In the acute variety, which is taken to be the most typical of the disease, one observes the common characteristics of any abdominal crisis to which are added the clinical criteria of intestinal obstruction; infrequently diarrheal activity (bloody fluxes) precedes the obstructive phenomena. The abdominal pain, which is the prime feature of all variations of the entity, may or may not be colicky and its localization is unpredictable, even shifting in a single case. Vomiting appears early or late, sometimes days after the initial seizure. Such late appearances aid in the differentiation between vascular occlusion and true intestinal obstruction.

The physical signs are comparatively moderate. Frequently there is a lack of notable abdominal distention despite its presence in the bowel routinely revealed in roentgenograms in the early stages.[32,33] Tenderness and rigidity are usually far below expectation and the temperature, pulse and blood count will generally be within normal limits, a frequent exception being leukocytosis of from 15,000 to 30,000 or more.

Notwithstanding some infrequent exceptions, the disparity between the intense symptoms on the one hand and the mild physical signs on the other constitutes a diagnostic feature that cannot be overemphasized. In all truth it may be stated that the paucity and indefiniteness of the early objective characters and laboratory items tend to be very misleading and disarming, and have in all probability been the basis of the all too numerous diagnostic errors.[1,2,16] Later, as the disease progresses to the stage of gangrene and peritonitis, the physical signs and laboratory data increase apace until in the final stages the overwhelming toxicity leads to profound shock, collapse and death. Acute mesenteric vascular occlusion may run its course in from one to six days with an average of three days.

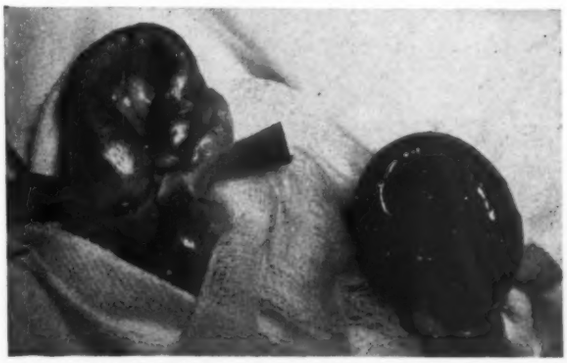

FIG. 1. Arterial type strangulation (left) compared with venous type strangulation after one hour. There has been a slight relaxation in the blanched, rippled appearance of the arterial type strangulation by now, but its mesentery is still free from petechiae and the bowel is pale, whereas the venous type strangulation is distended, weeping and blood-soaked. (LAUFMAN, H. and METHOD, H. The role of vascular spasm in recovery of strangulated intestine. Experimental study. *Surg., Gynec. & Obst.*, 85: 675–686, 1947.)

When describing the subacute type of mesenteric vascular occlusion the necessity arises of explaining the proper application of the term itself. The reference is to a mild clinical aspect of the disease that lasts from one day to one week or longer or that has remissions and extends over a period of months. Sooner or later, before the fatal termination, the subacute type enters its acute phase and so emerges the question: When is the mitigated aspect a type and when is it a phase? It is a matter of duration. If the subacute features persist or remit over a number of days and there is a relatively short acute stage, such an instance should be considered a subacute type of mesenteric vascular occlusion; whereas if the acute symptoms intervene within a day or two and are predominant, such a case should be classed as an acute type with a subacute prodromal phase. Personal judgment will at times have to decide the proper use of terms in particular instances.

It has been suggested that the subacute type or phase is associated with incomplete vascular obstruction.[2] In some of these cases well organized and recanalized thrombi have been described, indicating that they had existed for weeks or even months before total occlusion occurred.

Figure 2 taken from Hertzler's monograph tends to corroborate the view that incomplete

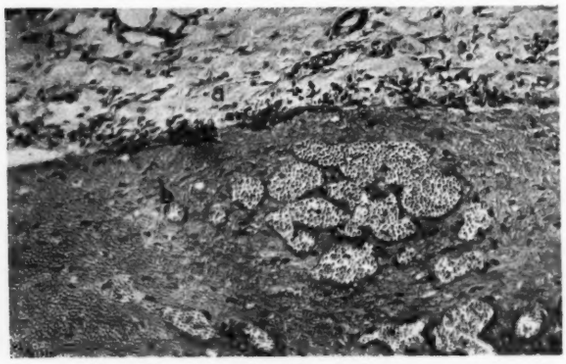

FIG. 2. Canalization of a blood clot in a mesenteric vein from a case of mesenteric thrombosis: (*a*) wall of the vein with fibrosis; (*b*) organizing blood clot; (*c*) newly formed vessels contain unchanged red cells. (HERTZLER, A. E. Surgical Pathology of the Peritoneum. Philadelphia, 1935. J. B. Lippincott Co.)

occlusion is the basis of "prodromal" phases in mesenteric vascular occlusion. Hertzler states: "It is obvious that the beginnings date back several weeks and that the acute symptoms date from the time when the affected vessel finally obstructs the circulation. These may represent premonitory changes." This concept is not without some merit even if not true for all cases as experience has demonstrated.

As would be expected, the symptoms and signs of the subacute type or phase are minimal and illusive although almost routinely a flat plate of the abdomen will reveal gas in the small bowel and at times indicate an obstruction. These roentgenologic findings are held to be of major significance in the diagnosis of subacute mesenteric vascular occlusion.[33]

In the third type, appropriately termed fulminating, from the very outset the patient is desperately ill, apprehensive and in a state of shock. The intense symptoms are progressive and unremitting; these include excruciating pain, continuous writhing, vomiting, cold wet body surface and fear. Here again, in a fulminating process and typical of mesenteric vascular occlusion in general, the early physical signs and laboratory data frequently will not compare in degree of intensity with the violent symptoms. Nevertheless the patient's attitude of utter desperation precludes any doubt as to the seriousness of the problem at hand. In fulminating occlusions death may ensue in less than twenty-four hours.

Diagnosis. Mesenteric vascular occlusion has seldom been diagnosed preoperatively. One cannot single out any symptom or sign that can be classed as pathognomonic. Furthermore, owing to the comparative rarity of the disease plus its graded types and phases, remarkable achievement along diagnostic lines is not to be anticipated. The important thing seems to be to suspect the condition when viewing abdominal crises. Fortunately, it is generally agreed that an accurate diagnosis is not an absolute necessity before instituting the life-saving operation.[34]

Although very often mentioned, hematemesis and bloody fluxes from the bowel are not important symptoms because seldom have they been encountered either together or separately. It would seem, however, that any case starting with hemorrhagic bowel movements and later showing signs of intestinal obstruction should certainly arouse suspicion of mesenteric vascular occlusion; yet as a rule the only blood found will be that on the examining finger.[1,6]

The x-ray has come to be considered a valuable aid in this diagnosis, both the routine flat plate and the procedure described by Rendick and Harrington.[6,28,32] Occlusion in any segment of the superior mesenteric system usually will appear in the roentgenogram as a mechanical obstruction at the splenic end of the transverse colon. When such is the case Rendick and Harrington suggest giving a barium enema; and if the column of barium passes through the area of simulated obstruction, a presumptive diagnosis of mesenteric vascular occlusion is in order. Although up to the present experience with this technic is very limited, it nevertheless stands as the best single test for differentiating a true intestinal block from the stasis resulting from vascular occlusion. Reich and Love in their special roentgenologic studies in "mesenteric thrombosis" make note of the diagnostic significance of the "discrepancy between the roentgen finding of small bowel obstruction and the clinical finding of a silent abdomen."[32]

A diagnosis of mesenteric vascular occlusion is possible if the following points are carefully noted: (1) The entity must be thought of whenever differentiating abdominal disturbances. (2) All factors in the etiologic background should be checked. (3) The disparity between the intense symptoms and the moderate physical signs during the early stages should arouse suspicion. (4) Roentgenologic evidence should be obtained by both the routine plate and the procedure described by Rendick and

Harrington. (5) A fair knowledge of the three clinical types of the disease is essential.

A comprehensive differential diagnosis will not be taken up in the present discussion, but the importance of differentiating this disease from other abdominal crises (pancreatitis, intestinal obstruction, etc.) lies in the fact that while many of these can often be successfully treated by conservative means mesenteric vascular occlusion can never be so handled.[7,32,33]

Prognosis. Up to about ten years ago the prognosis of this catastrophic ailment almost invariably was stated to be hopeless; the mortality was indeed practically 100 per cent.[1,3,4,14,20] However, curiously enough on January 12, 1912, E. Boinet reported a 45.8 per cent recovery in twenty-four patients who had had enterectomy for "mesenteric embolism"; Boinet even encountered a number of cases of "curable" intestinal embolism in debilitated men with pneumonia and bronchitis.[14] This achievement will have to be credited to individual good fortune and personal excellence, especially in such an early era.

In the latter decade the outlook has improved progressively. This can in part be attributed to advances in pre- and postoperative methods, modalities and newer drugs, but of much greater importance is the earlier application of radical surgery. In view of the urgent nature of the pathologic underlying process the emphasis on early intervention cannot be overstressed.[33]

Of particular prognostic interest is the length of bowel consistant with the maintenance of physiologic balances or at least of leading a useful life. This question could easily become quite involved but general experience has proven beyond a doubt that the answer is not merely one of feet and inches; there is that inestimable factor of the personal equation. Also, the length of the small bowel has been variously estimated to be from a minimum of 10 feet to a maximum of 28 feet.[29] The answer to the problem is probably best summed up by Weckesser et al. as follows: "It appears that distal resections of the small bowel are less well tolerated than proximal resections. It appears in general that resections of 30 to 50 per cent are usually well tolerated and also that many patients do satisfactorily with greater percentages removed."

Numerical prognostications are nowhere available. In our series of twelve cases there was an over-all mortality of 75 per cent; two were terminal cardiac patients, one subject had uremia, one portal vein thrombosis, one neonatal complexity and one periarteritis nodosa. Of four valid surgical cases three had successful resection and lateral anastomosis.

TREATMENT

A comprehensive management of mesenteric vascular occlusion must include complete elimination of the infarction, special measures to combat shock, release of reflex vessel spasm, and prevent the spread of visceral sepsis, mitigate the ravages of ileus, maintain fluid and electrolyte balances and check further thrombogenesis.

There being no alternative, the *sine qua non* of treatment is the excision of all necrotic bowel. In resecting it seems that only the mesentery adjacent to the intestine need be removed and in establishing continuity a side-to-side anastomosis is preferred. Very frequently because of the "poor general condition of the patient" a resection is not attempted. Concerning the operability of these cases Dunphy and Whitfield state as follows: "As has been emphasized many times before, the poor general condition of these patients is no argument against resection since the alternative is a fatal issue. These patients seemed to be in better physical condition immediately after than immediately before the operation."[7]

A number of observations have appeared on the spontaneous recovery of some of these cases in which the involvement was calculated to be "too extensive."[1,5,30,31] The diagnoses in such instances are to be viewed with suspicion since vascular occlusion can be simulated by passive congestion, released internal incarceration and anaphylactoid shock.

Figure 3 from Thorek's textbook is an illustration of anaphylactoid reaction in the small intestine and it clearly shows the striking similarity between visceral allergy and mesenteric vascular occlusion.[30]

Among the cases in Table II there were three of the acute, three of the fulminating and six of the subacute type of this disorder. There were nine male and three female patients, and the ages ranged from neonatal to eighty-two years, six being in the thirty- to sixty-year span.

The three case histories that follow pertain to the successful instances of the present series.

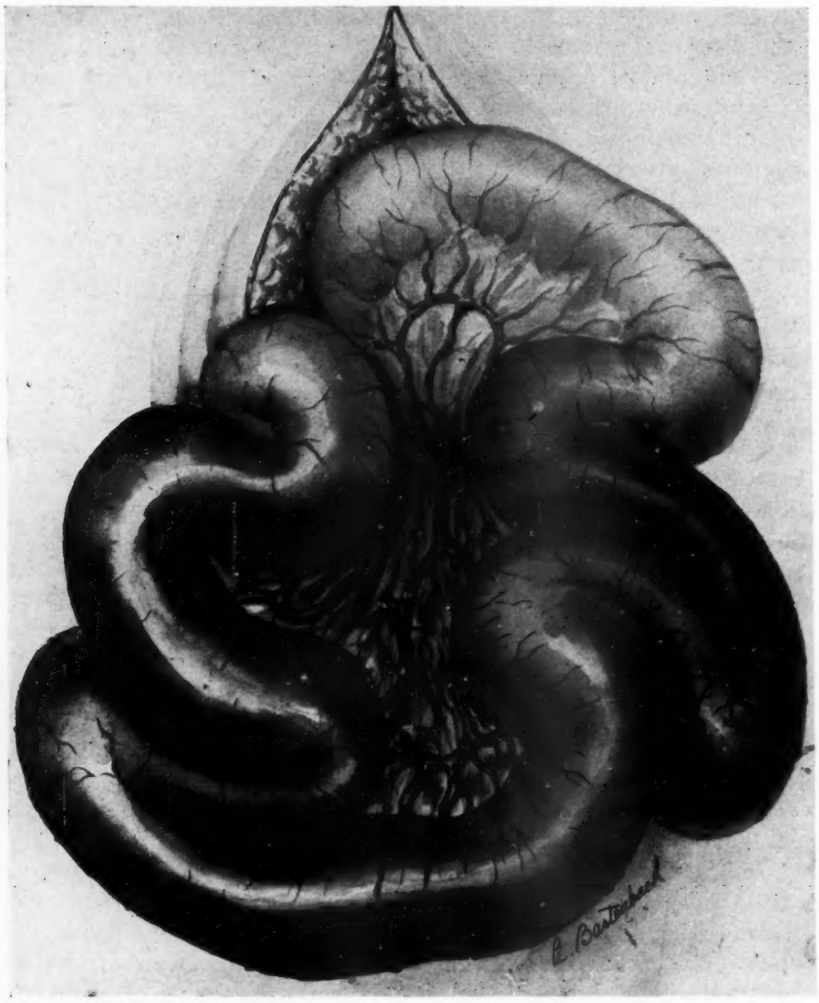

FIG. 3. Mesenteric occlusion; recovery under conservative treatment. Doctor Thorek considered the pathologic condition due to visceral allergy, a form called anaphylactoid visceral apoplexy. (THOREK, M. Surgical Errors and Safeguards, 4th ed. Philadelphia, 1943. J. B. Lippincott Co.)

CASE 4. This patient had a subacute type of mesenteric vascular occlusion. C. G., age fourteen, a white boy, was admitted July 8, 1948, and discharged improved July 19, 1948. He was admitted to the ward at 4:30 A.M. complaining of diffuse pain in the lower abdomen; there was no nausea or vomiting. An enema was given at 6 A.M. with good results. The patient had had an appendectomy the previous year at which time a bluish discoloration of the ileum was noted.

No rigidity, masses, distention or hyperperistalsis were found. There was some slight tenderness in both lower quadrants. Results of rectal examination were negative. Temperature was 99°F., pulse 88, white blood count 12,500 with 68 polymorphonuclears; urinalysis was negative. There was no occult blood in the stool. The flat plate indicated a small bowel obstruction; impression: postoperative adhesions.

There was no transition of symptoms; the subacute aspect continued and two days after admission the patient was seriously being considered for discharge without surgery. However, roentgenogram had revealed some small intestinal stasis (adhesions?), so an operation was performed. Five feet of black, gangrenous ileum were removed and a side-to-side ileocolostomy performed.

Four years after the patient's release from the hospital there were still three or four soft bowel movements a day, showing no impairment of the general health.

CASE 8. This case was of the subacute type. J. M., a forty-eight year old white man, was admitted August 22, 1949, and discharged

cured September 19, 1949. For eight days prior to admission he had had cramp-like pains in the right side with no vomiting or melena. After admission pains were sharper and had shifted to the epigastrium. He had had a similar episode fifteen years before, diagnosed as peptic ulcer. was full of black bloody contents and the mesentery markedly edematous and hemorrhagic. Excision of diseased bowel and lateral anastomosis were performed.

Three-year follow-up was entirely without abnormal incident.

TABLE II
TABULATION OF TWELVE CASES

No. of Case	Name and Age	Type	Procedure	Result	Comments
1	G. S., 82	Acute	No operation	Expired	Cardiac death; occlusion was correctly diagnosed as a terminal complication
2	A. H., 68	Acute	Exploratory; no resection	Expired	In retrospect it is considered that a resection should have been attempted
3	L. L., 42	Acute	Resection and anastomosis	Expired	Uremic death
4*	C. G., 14	Subacute	Resection and anastomosis	Recovered	There had been no clinical transition from the subacute to the acute phase although black gangrene was present some time
5	H. F., 55	Subacute	Resection and anastomosis	Expired	Cardiac death; occlusion was caused by periarteritis nodosa
6*	B. P., neonatum	Subacute	(1) Ramstedt's operation; (2) resection and anastomosis	Expired	Autopsy failed to reveal the cause of the 23 days' melena or vascular occlusion
7	M. A., 53	Subacute	Resection and anastomosis	Expired	Thrombogenesis progressed postoperatively
8	J. M., 48	Subacute	Resection and anastomosis	Recovered	With a 10-day history there was mottled necrosis but no symptomatic transition to the acute phase preoperatively
9	A. R., 65	Subacute	No operation	Expired	Entire small bowel involved
10	W. H., 58	Fulminating	Resection and anastomosis	Recovered	Early operation saved patient; started six hr. after onset
11	J. C., 71	Fulminating	No operation	Expired	Comparable to Case 10; should have had benefit of early operation; "too shocked"?
12	J. R., 30	Fulminating	No operation	Expired	Succumbed 2 to 3 hr. after occlusion of portal vein

* These cases were thought to be possible instances of anaphylactoid visceral shock (allergy).

The patient was obese and not greatly distressed. The abdomen was soft with some intermittent spasm and no rebound, audible peristalsis. No blood was found in the stool. Temperature was 100°F., white blood count 31,650 with eighty-six polymorphonuclears, and red blood count 4,490,000 with 13 gm. hemoglobin. Abdominal roentgenogram was negative; impression: perforating peptic ulcer, acute appendicitis.

Because of persistence of abdominal distress with "knife-like episodes" an operation was undertaken the day following admission. A large amount of straw-colored peritoneal fluid was encountered. Two feet of mottled reddish-purplish ileum were discovered; the lumen

CASE 10. The patient had a fulminating type. W. H., a fifty-eight year old Negro, was admitted March 4, 1945, and discharged cured on March 20, 1945. While eating supper he had become violently ill with severe cramps and vomiting. There was no bowel action or hematemesis. The symptoms worsened progressively and shock supervened. The patient was writhing continuously and bending over to vomit. His skin was cold and wet. Facies denoted marked degree of fear. There was some distention as well as rebound and light generalized tenderness. His temperature was 97°F., pulse 96 and respiration 18. Blood count and urine were normal; impression was volvulus.

Six hours after admission a laparotomy was performed. A small quantity of serous fluid was present which was not noticeably blood-tinged. Four feet of purplish ileum, swollen and filled with black, blood-stained material, were delivered and excised and a lateral enteroanastomosis performed. The postoperative course was stormy for three days but, after spontaneous bowel evacuation, was impressively uneventful. The pathologist reported thrombosis of veins of the ileum.

When last seen seven years after hospitalization all physiologic functions were perfectly normal.

SUMMARY

1. A highlighted review of mesenteric vascular occlusion has been presented.

2. A suggestion is offered to divide the disease into three clinical types: acute, subacute and fulminating.

3. A report of the findings in fifty specially selected autopsy specimens is given which tends to disprove the presence of primary sclerosis of the vessels in the mesenteric bed.

4. A case caused by periarteritis nodosa is recorded.

5. Twelve new instances are reported in tabular form.

6. Included are the epitomized histories of three cases in which operation was successful.

REFERENCES

1. Musgrove, J. E. and Seybold, W. D. Mesenteric vascular occlusion. *S. Clin. North America*, 30: 1063–1071, 1950.
2. Hertzler, A. E. Surgical Pathology of the Peritoneum. Philadelphia, 1935. J. B. Lippincott Co.
3. Eisenberg, A. S. and Schlink, A. B. Mesenteric vascular occlusion. *Surg., Gynec. & Obst.*, 27: 66–72, 1918.
4. Trotter, L. B. Embolism and Thrombosis of Mesenteric Vessels. London, 1913. Cambridge University Press.
5. Stengel, A. Diseases of the Intestines. In: Modern Medicine by Osler and McCrae, 2nd ed., vol. 3, p. 437. Philadelphia, 1914. Lea & Febiger.
6. Ficarra, B. J. Mesenteric vascular occlusion. *Am. J. Surg.*, 66: 168–177, 1944.
7. Dunphy, J. E. and Whitfield, R. D. Mesenteric vascular disease. *Am. J. Surg.*, 47: 632–638, 1940.
8. Garvin, E. J. Mesenteric vascular occlusion complicating thromboangiitis obliterans. *Am. J. Surg.*, 74: 211–215, 1947.
9. Fallis, L. S. Mesenteric thrombosis—operation—recovery. *Am. J. Surg.*, 47: 128–130, 1940.
10. Brown, M. J. Mesenteric venous occlusion—a clinical entity. *Am. J. Surg.*, 49: 242–249, 1940.
11. Boyd, W. Surgical Pathology, 6th ed., pp. 91–93. Philadelphia, 1947. W. B. Saunders Co.
12. Wangensteen, O. H. Vascular Obstruction—Small and Large Intestine. In: Christopher's Textbook of Surgery, 4th ed., pp. 1056–1058. Philadelphia, 1945. W. B. Saunders Co.
13. Schaefer, P. W. Pathology in General Surgery. Chicago, 1950. University of Chicago Press.
14. Robertson, W. E. Diseases of the Intestines. In: Sajou's Analytic Cyclopedia of Practical Medicine, 5th ed., pp. 734–737. Philadelphia, 1923. F. A. Davis Co.
15. Saltzstein, H. C. Mesenteric thrombosis of lower ileum following resection of the sigmoid colon for carcinoma. *Am. J. Surg.*, 75: 854–858, 1948.
16. Madding, G. F. and McIntire, F. T. Superior mesenteric artery occlusion. *Am. J. Surg.*, 74: 475–479, 1947.
17. Moschowitz, E. Hyperplastic arteriosclerosis versus atherosclerosis. *J. A. M. A.*, 143: 861–865, 1950.
18. Maximow, A. A. and Bloom, W. Histology, pp. 240–241. Philadelphia, 1948. W. B. Saunders Co.
19. Altschul, R. Selected Studies on Arteriosclerosis. Springfield, Ill., 1950. Charles C Thomas.
20. Benjamin, D. Mesenteric thrombosis. *Am. J. Surg.*, 74: 338–343, 1948.
21. Knepper, P. A., McDaniel, J. R., Brooker, R. M. and Neudorf, L. G. Primary mesenteric thrombosis treated with resection and anticoagulants. *Am. J. Surg.*, 80: 937–940, 1950.
22. Karsner, H. T. Acute Inflammations of Arteries. Monograph. Springfield, Ill., 1947. Charles C Thomas.
23. Laufman, H. and Method, H. The role of vascular spasm in recovery of strangulated intestine. Experimental study. *Surg., Gynec. & Obst.*, 85: 675–686, 1947.
24. Derr, J. W. and Noer, R. J. Experimental mesenteric vascular occlusion. *Surg., Gynec. & Obst.*, 89: 393–397, 1949.
25. Robinson, A. Cunningham's Textbook of Anatomy. New York, 1915. W. Wood & Co.
26. Koon, E. S., Jr. Mesenteric vascular occlusion. *J. A. M. A.*, 143: 1408–1409, 1950.
27. Vaughan, A. M. The acute abdomen with special reference to symptoms, diagnosis and surgical treatment. *Am. J. Surg.*, 47: 602–611, 1940.
28. Rendick, R. A. and Harrington, L. A. Roentgenologic observations in mesenteric thrombosis. *Am. J. Roentgenol.*, 52: 317–322, 1944.
29. Weckesser, E. C., Chinn, A. B., Scott, M. W. and Price, J. W. Extensive resection of the small intestine. *Am. J. Surg.*, 78: 706–714, 1949.
30. Thorek, M. Acute Mesenteric Occlusion. Surgical Errors and Safeguards, 4th ed., pp. 478–484. Philadelphia, 1943. J. B. Lippincott Co.
31. Chorba, W. G. Case of massive internal incarcerated hernia. Paper read before the Bronx Surgical Society, April 25, 1949.
32. Reich, S. B. and Love, L. Mesenteric thrombosis. *New York State J. Med.*, 51: 2909–2912, 1951.
33. Duncan, R. D., Ferrell, T. E. and Hansbro, G. L. Acute mesenteric venous thrombosis. *Am. J. Surg.*, 83: 205–208, 1952.
34. Berry, R. E. L. Diagnosis and treatment of acute intestinal obstruction. *J. A. M. A.*, 148: 347–355, 1952.

AN UNFAVORABLE REACTION TO THE USE OF STREPTOKINASE-STREPTODORNASE IN INDOLENT POSTROENTGEN IRRADIATION ULCERATION

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In the past two years contributions to the literature dealing with effective use of streptokinase-streptodornase in certain surgical conditions have appeared with increasing frequency.[4,15,17,18,21,22,25] During this same period several articles have appeared reporting untoward reactions to the use of this substance.[9,16] It is the purpose of this article to report two cases of indolent postroentgen irradiation ulceration which responded unfavorably to the use of streptokinase-streptodornase.

The development of the use of streptokinase-streptodornase, its historic background and its mode of action have been adequately described and discussed in many contributions to the literature and need not be repeated here.[5,19,20]

It may be well to point out, however, that these enzymes have found some degree of usefulness in the management of wounds where clotted blood, fibrinopurulent accumulations or necrotic material is present. The enzymes serve to remove these substances and thereby facilitate spontaneous healing or prepare the area for surgical intervention. Among the conditions in which the clinical value of streptokinase-streptodornase has been suggested are hemothorax, hematoma, empyema and chronic suppurations, including infected wounds and ulcers of the decubitus type, with a poor blood supply.

Some authors have stated that after effecting a physiologic curettage of the area by means of enzymatic débridement, an appreciable increase in the blood supply to the involved area results. The improved blood supply stimulates normal healing processes including the formation of granulation tissue. It is to be particularly emphasized that these enzymes are claimed to exert their beneficial effects by action on dead cells only. This article is presented as a challenge to this position. The authors believe that streptokinase-streptodornase digests cells which are in a marginal state of viability after intensive irradiation. For this reason streptokinase-streptodornase should not be used after irradiation unless as a preliminary to extensive reparative surgery.

We have been unable to find any reports dealing with the use of streptokinase-streptodornase in the treatment of indolent postroentgen irradiation ulceration prior to our experience with these substances.

With the foregoing facts and theories regarding the actions of these substances in mind, it seemed reasonable to suppose that these enzymes would be of value in the treatment of indolent postroentgen irradiation ulceration. The management of these ulcers, which occur in devitalized tissue with a severely reduced blood supply, has been exceedingly difficult in the past. A variety of substances including aloe vera leaf, sulfallantoin ointment, zinc peroxide paste and radon ointment, and the like, has been used in the management of these lesions, with varying degrees of success.[1,7,8,10,12,13,23,24]

It was hoped that streptokinase-streptodornase† would prove to be a valuable adjunct in the treatment of extensive postirradiation soft tissue necrosis particularly in view of the claimed immunity of living cells to its action. However, as will be seen in the case reports herein submitted, this hope was not realized.

CASE REPORTS

Case 1. O. T. (No. C-11411), a forty-five year old white woman, was first seen in the

† The preparation used was "Varidase," streptokinase-streptodornase (Lederle). One vial of this preparation containing streptokinase, 100,000 units, and streptodornase, 25,000 units, was diluted with 20 ml. of sterile saline solution. This was applied directly to the wound as a continuous wet dressing using cotton gauze. A fresh solution was prepared every twenty-four hours. The streptokinase-streptodornase used in the cases presented was always prepared and applied in the same manner.

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American Oncologic Hospital on February 2, 1951, with the following history:

In March, 1945, a left radical mastectomy was performed upon her elsewhere. The histopathologic diagnosis was adenocarcinoma of the breast (grade IV) without evidences of axillary metastasis. No roentgen therapy was delivered immediately postoperatively.

Two months prior to admission (December, 1950), the patient noted a skin nodule lateral to the surgical scar. A biopsy was performed and the histopathologic report was secondary adenocarcinoma of the skin. The patient was referred to the senior author for roentgen therapy. On admission two skin lesions were present, one lateral to the scar measuring 2.5 by 3.5 cm. and one medial to the scar 1.0 cm. in diameter. The left axilla contained a hard metastatic lymph node 2.5 cm. in diameter fixed to the medial axillary wall. Survey roentgenograms of the chest and skeletal system showed no evidence of metastasis.

Roentgen therapy was delivered to the axilla as follows: The axilla was treated with a combination of conventional 200 kv. roentgen therapy, supervoltage 1.75 megavolt roentgen therapy followed by interstitial radon implants. The details of the treatment are as follows: Between February 15, and March 7, 1951, 2,100 r (in air) were delivered to a left direct axillary portal measuring 10 by 10 cm. The following factors were used: 200 kv.p., 20 ma., 53 cm. T.S.D., 1 mm. Cu plus 1 mm. Al filter, half value layer 1.2 mm. Cu. Between February 14, and March 8, 1951, 2,400 r (in air) were delivered to the left posterior axillary portal measuring 9 by 11 cm. The following factors were used: 200 kv.p., 20 ma., 51 cm. T.S.D., 1 mm. Cu plus 1 mm. Al filter, half value layer 1.2 mm. Cu. Between March 13, and April 9, 1951, 4,200 r (in air) were delivered to a left axillary portal measuring 8 by 10 cm. using supervoltage therapy.* The following factors were used: 1.75 Mev., 180 ma., 70 cm. T.S.D., 11.7 mm. Pb equivalent filtration.

A total tumor dose of 6,900 roentgens was delivered to the left axilla. On May 10, 1951, this dosage was supplemented with 4,000 gamma roentgens delivered by means of interstitially implanted gold radon seeds.

The skin nodules were treated in the following manner: Between February 2, and March 6, 1951, 5,900 r (in air) were delivered to the left infraclavicular nodule using a field measuring 4.5 by 0.5 cm. The following factors were used: 200 kv.p., 20 ma., 40 cm. T.S.D., 0.5 mm. Cu plus 1.0 mm. Al filter, half value layer 0.9 mm. Cu.

Between February 2, and March 13, 1951, 6,800 r (in air) were delivered to the left parasternal mass using a field measuring 4 by 5 cm. The following factors were used: 140 kv.p., 15 ma., 30 cm. T.S.D., inherent filtration, half value layer 0.25 mm. Cu.

A brisk ulcerative epidermitis developed in all the treatment portals. Complete healing occurred in one month.

On May 19, 1951, the patient presented herself with a superficial ulcer, 1 cm. in diameter, at the site of treatment in the left parasternal area. She could recall no definite injury to this area. Vaseline gauze dressings were applied.

On June 11, 1951, an eczematoid type of reaction on the skin around the ulcer was noted. This was managed with compresses of ¼ per cent solution of silver nitrate.[1] The eczematoid reaction completely subsided by June 29, 1951. At this time the ulcer had not changed in size and was about 3 to 4 mm. deep. The surface was covered with a superficial layer of necrotic material.

At this juncture the use of streptokinase-streptodornase was planned in the management of the ulcer. On June 29, 1951, streptokinase-streptodornase was applied in the usual manner as a wet dressing for forty-eight hours. It was reapplied on five occasions, between July 6, and July 13, 1951.

During this time large quantities of foul-smelling material exuded from the wound and the eczematoid reaction reappeared. The ulcer increased in diameter and depth with dramatic and alarming rapidity and on July 29, 1951, it measured 5.8 by 4.6 cm. The depth of the ulcer also increased. The medial end of the fourth rib was visible. The rib was surrounded by necrotic material. A febrile reaction developed. The patient's temperature rose to 102°F. and remained at this level for five days. Mediastinal perforation and mediastinitis appeared imminent. Because of the unfavorable reaction to streptokinase-streptodornase this medication was stopped. Large doses of penicillin were administered parenterally.

On August 30, 1951, necrotic rib and sternum were removed surgically and several soft tissue

* Supervoltage therapy generated at a voltage of 1.75 Mev.

biopsies were performed. The histopathologic report showed no evidence of residual malignancy.

Employing activated zinc peroxide paste and radon ointment, the ulcer decreased in size from 5.8 by 4.6 cm. to 3.8 by 3.6 cm. in six weeks and required seventeen weeks to heal. (Fig. 1.) There has been no evidence of local recurrence or metastasis. At present the wound remains healed.

Case II. F. S. (No. C-11076), a forty-eight year old white unmarried woman, was first seen in the American Oncologic Hospital on August 15, 1950, with the following history:

In March, 1946, she first noted a painless lump in the right breast. Because of fear the patient did not seek professional advice. The lesion slowly increased in size and in 1948 ulceration occurred. Nevertheless, not until August, 1950, because of repeated severe hemorrhages (five in one week) did the patient consult her family physician. She was immediately referred to the senior author for management.

On admission the right breast was almost completely replaced by carcinoma. A large fixed invasive neoplastic mass with central ulceration was present. The lesion extended beyond the midline to involve the left breast in its inner one-third and was fixed to the sternum and ribs. The over-all dimensions of the tumor were 15 by 11 by 6 cm. In the right axilla were several large hard lymph nodes obviously metastatic. The largest node measured 5 cm. in diameter.

Biopsy of the lesion was performed. The histopathologic diagnosis was anaplastic carcinoma. Amazingly enough, in view of the long history and the histologic type, survey roentgenograms of the chest and skeletal system showed no evidence of metastasis.

A bilateral oophorectomy was performed and supervoltage x-ray therapy was delivered as follows: Two overlapping tangential portals were outlined to include the right breast and axilla. One portal measured 10 by 15 cm. and the beam was directed medially. A second portal measured 11 by 15 cm. and the beam was directed laterally. The physical factors used in treatment were 1.75 Mev., 180 ma., 70 cm. T.S.D., and 11.7 mm. Pb equivalent filter. In a period of three months, 8,800 r (in air) were delivered to the first portal and 9,100 r (in air) were delivered to the second portal. A minimal tumor dose of 10,700 roentgens were achieved. The width and depth of the portal were so rigidly controlled that a negligible volume of pulmonary tissue was irradiated. Pneumonitis did not develop.

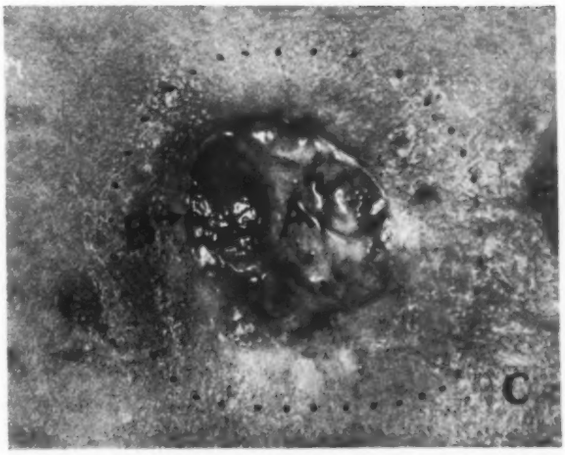

Fig. 1. Ulcer of left anterior chest wall in Case 1. Late stages of healing. Note greatest area of ulceration (dotted line), bed of resected rib (A), granulation tissue (B) and eczematoid reaction (C).

Serial biopsies were performed throughout the course of therapy. Because of the presence of malignant cells of questionable viability in the biopsy specimens at the completion of supervoltage therapy a radium applicator was constructed and an additional 1,650 gamma roentgens (at 2 cm. depth) were delivered to an area measuring 9 by 6 cm.

An additional 4,600 r (in air) were delivered to the axilla through a 10 by 12 cm. portal using the following factors: 200 kv.p., 20 ma., 50 cm. T.S.D., 1 mm. Cu plus 1 mm. Al filtration, half value layer 1.2 mm. Cu. This resulted in an additional tumor dose of 4,700 r (at 3 cm.).

A total tumor dose of 15,400 r was delivered to the axilla and a total tumor dose of 12,300 r was delivered to the breast. Representative biopsies at the completion of therapy showed no evidence of residual cancer. The ulcer which was present at the outset of therapy had decreased considerably in size, particularly in depth, and measured 7.3 by 4.5 by 1 cm. at the completion of treatment. The ulcer was healing slowly.

Following therapy the patient failed to return for six weeks. When she did return on April 3, 1951, in response to follow-up inquiry the ulcer had become deeper and wider. The base was necrotic and discharging purulent material

2

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FIG. 2. Ulceration of right chest wall in Case 11 in healing stage. Note delayed plastic flap which was developed on left breast (A), area of ulceration (B), area of deepest penetration of ulcer (C).

FIG. 3. Close-up view of healing ulcer involving right chest wall in Case 11. Note greatest area of ulceration (dotted line), healing ulcer (A), deepest perforation of chest wall and site of resection of rib and sternum (B) and regressing eczematoid type of dermatitis (C).

copiously. The skin surrounding it was involved with an eczematoid type of dermatitis spreading in all directions beyond the limits of irradiation therapy.[1]

The patient was admitted to the hospital and the infection was controlled by means of local and parenteral penicillin. The eczematoid dermatitis healed with wet dressings of ¼ per cent silver nitrate solution. A delayed flap was elevated on the left breast in preparation for possible excision of the ulcer and chest wall and plastic repair of the defect.

On June 29, 1951, streptokinase-streptodornase was started in an effort to clean up the ulcer further prior to surgical intervention. The solution was applied as a wet dressing for forty-eight hours in the usual manner on six occasions between June 29, 1951, and July 20, 1951. The ulcer, with unbelievable rapidity, became wider and deeper. The necrotic material increased in depth and one rib and the sternum became exposed. Because of these unfavorable reactions and the danger of breakdown of the entire thickness of the chest wall applications of streptokinase-streptodornase were discontinued. On August 12, 1951, the patient had a severe hemorrhage from the ulcer due to erosion of the intercostal vessels. Due to the large amount of stringy necrotic material present rib resection was necessary as a preliminary to the control of hemorrhage. (Figs. 2 and 3.)

The hemoglobin level declined from 90 to 54 per cent and the patient went into a state of shock. Eight blood transfusions (500 cc. each) were required to restore the blood picture to normal.

Following this experience the wound was dressed with activated zinc peroxide paste and radon ointment was employed. The wound has become clean, and healthy granulation tissue is present throughout. Excision of the ulcer and plastic repair are planned in the near future.

COMMENTS

Among the reported reactions to the use of streptokinase-streptodornase are the following: (1) An outpouring of fluid and living polymorphonuclear leukocytes into the area treated; (2) a pyogenic constitutional reaction with temperature elevation accompanied by malaise, headache, arthralgia, nausea and occasional vomiting; (3) allergic reactions.[9,16]

Hubbard[9] had studied twenty-eight cases with reference to acute and delayed toxicity to these substances. He concluded that the transitory reactions he observed, such as fever, leukocytosis, hyaline casts in the urine and proteinuria, closely resemble the response to non-specific parenteral protein therapy and that the reactions were not attributable to the enzyme present.

In both of our cases an outpouring of fluid

and debris developed during the course of streptokinase-streptodornase therapy. In the first reported case the febrile reaction could have been due to the so-called "pyogenic reaction" or to local infection alone. It is interesting to note, however, that even though infection was present for some while, fever did not develop until streptokinase-streptodornase was applied. We believe, as do Tillett and Sherry,[21] that the cause of the fever may be explained on a basis of digestion by these enzymes of the "walling off process" present in localized infections. The resultant increased absorption of pyogenic material could then theoretically give rise to a febrile reaction.

We have not observed an allergic response to the use of these enzymes. It is interesting to note that an eczematoid type of dermatitis complicated both cases. This, however, is not an infrequent complication of late irradiation ulcers.[1] It could be due to autosensitization to the patient's own discharges and not to the use of streptokinase-streptodornase.[2] The marked increase in the discharge may have been a factor. The eczematoid reaction responded favorably in both instances to compresses of ¼ per cent solution of silver nitrate which the senior author has used for many years in the treatment of this condition.

The most significant and dramatic unfavorable reaction observed was the remarkable rapid increase in the depth and width of the ulcers. The depth of the ulcers increased so rapidly that the integrity of the chest wall was endangered in each of the reported cases. In this connection it should be remembered that these enzymes are expected to debride ulcers by digesting necrotic material only, while viable cells remain undisturbed.

The rapidity with which these ulcers increased in size is most unusual. The rapid breakdown took place during the period streptokinase-streptodornase therapy was employed. When the use of these enzymes was discontinued, the size of the ulcers remained stationary but healing did not begin to take place until treatment with activated zinc peroxide paste and radon ointment was started.

The rapid increase in the size of the ulcers and the increase in the amount of necrotic material called for an explanation. A basic understanding of the changes occurring in tissue following intensive irradiation, knowledge of the pathology of late postirradiation ulceration and familiarity with the known facts concerning the physiologic action of streptokinase-streptodornase may contribute to the explanation of the untoward phenomena herein reported.

As is well known, heavy dosage of ionizing irradiation produces changes in tissue which impair its blood supply and vitality. These changes may become progressively more severe until a point is reached where many of the cells are just able to maintain their viability. These can be called marginally surviving cells. These cells can survive and carry on under ideal conditions. Under even the mildest adversity, these marginal cells die. It is on this basis that late irradiation ulceration develops, either spontaneously or following trivial injury. When ulceration develops, the vitality of many of these marginal cells is further impaired due to infection superimposed on the poor blood supply. Heavily irradiated tissue tolerates infection poorly for obvious reasons.

With conservative management, including general supportive measures, such as whole blood or plasma transfusions, antibiotics, parenteral vitamins and local measures such as activated zinc peroxide paste, radon ointment and the like, these indolent ulcers may heal. Many of the heavily irradiated cells which are marginally surviving in the presence of adverse influences and are on the verge of cellular death recover sufficiently to contribute to the process of repair. It must be emphasized that these marginal surviving cells must be carefully nursed if healing is to take place. Streptokinase-streptodornase appears to add to the adverse environment.

Streptokinase acts by activating plasminogen to plasmin. Under the influence of plasmin, fibrin undergoes protolysis. Streptodornase is an enzyme which catalyzes the breakdown of desoxyribonucleoprotein. Johnson[11] noted that a considerable portion of chronic inflammatory exudates is composed of degenerating and degenerated cells which usually are not differentiated from living cells by customary counting methods. When streptokinase-streptodornase is introduced into an area, there is a marked decrease in degenerating and degenerated cells. Clumps of leukocytes are broken up and highly viscous purulent fluids become liquid. "It has been emphasized that these enzymes have no effect upon living cells." It has also been

emphasized that there was no alteration in motility, phagocytosis or ability to mobilize glucose.

All of these findings are probably true of healthy cells but "we believe that devitalized and sick, heavily irradiated, marginally surviving cells, even though not dead, are affected by these enzymes just as are necrotic cells, and are destroyed." Thus submarginally surviving irradiated cells which under ideal circumstances would have a chance to recover to the status of relatively stable marginal cells are destroyed. In consequence the necrotic material increases in amount.

This hypothesis could account for the rapidity with which the ulcers increased in size and could also account for the marked increase in amount of necrotic tissue. With these thoughts and experiences in mind we have discontinued the use of streptokinase-streptodornase in the management of certain late postirradiation ulcers until further experimental work clarifies the situation.

It would appear to be dangerous to use this material in postirradiation ulcers in areas such as the chest wall where perforation may develop or areas where large blood vessels are contained in the tissue bed, for example, in the axilla, groin or lateral neck. It may prove to be useful in other situations in which there is a deep tissue bed such as in the thigh or buttocks.

SUMMARY

Two cases of late postirradiation ulceration of the anterior chest wall which showed an extremely unfavorable and almost fatal reaction to treatment with streptokinase-streptodornase are reported.

In each reported case the ulceration increased in size with amazing rapidity. The necrotic material present increased in amount. A febrile reaction developed which we believed was due to increased absorption of pyogenic material as a result of digestion of the "walling off process." In each case perforation of the chest wall appeared likely, and mediastinal perforation was imminent.

Both cases were complicated by an eczematoid type of dermatitis which is occasionally seen in association with heavily discharging indolent postirradiation ulceration. This reaction conceivably could have been stimulated or aggravated by the increased discharge following the use of streptokinase-streptodornase.

The rapid breakdown of the ulcers occurred during the time of application of streptokinase-streptodornase. The marked sudden change in an indolent ulcer and the increase in the amount of necrotic material required an explanation. An understanding of the fundamental changes produced in tissue by high doses of ionizing radiation, knowledge of the pathology and clinical course of late postirradiation ulceration and familiarity with the physiologic action of streptokinase-streptodornase contribute to the explanation of the untoward reaction herein reported.

We believe that many irradiated cells whose blood supply and vitality have been impaired are in a marginal state of viability. A number of these cells which form the base and edges of an indolent ulcer with ideal supportive treatment would survive and contribute to the process of repair or at least would not interfere with the process. On the other hand these cells in a state of marginal viability are destroyed and digested by these enzymes, thus contraindicating their use.

Because of these untoward reactions we have discontinued the use of streptokinase-streptodornase in the treatment of indolent postirradiation ulceration of certain areas, for example, the chest, lateral neck, axilla and groin.

It is possible that these enzymes may prove to be useful in areas in which the tissue bed is deep or where large blood vessels are not contained in the tumor bed.

REFERENCES

1. Castigliano, S. G. Dermatoses associated with roentgen therapy. *Am. J. Roentgenol. and Rad. Therapy*, 46: 5, 1941.
2. Castigliano, S. G. Cancer of the Skin. In: Dermatology. Edited by: Greenbaum, S. Philadelphia, 1949. F. A. Davis Co.
3. Castigliano, S. G. Epidermoid carcinoma of the skin of the head and neck. A brief consideration of factors operative in the selection of treatment. *Mississippi Valley M. J.*, 72: 177–181, 1950.
4. Cathie, I. A. B. and MacFarlane, J. C. W. Adjuvants to streptomycin in treating tuberculous meningitis in children. *Lancet*, 2: 784, 1950.
5. Christensen, L. R. Streptococcal fibrinolysis—a proteolytic reaction due to a serum enzyme activated by streptococcal fibrinolysin. *J. Gen. Physiol.*, 28: 632, 1945.
6. Dragstedt, C. A. The digestion of living tissue by proteolytic enzymes. *Science*, 98: 131, 1943.
7. Friche, R. E. and Williams, M. Radon ointment treatment of irradiation ulcers. *Radiology*, 45: 156–161, 1945.

8. Griffith, J. Q., Pendergrass, E. P., Perryman, C. R. and Hasker, J. Effect of radon-containing ointment on cutaneous lymph flow and minute vessels of the skin. *Proc. Soc. Exper. Biol. & Med.*, 61: 70–72, 1946.
9. Hubbard, W. N. Toxicity of Streptokinase-Streptodornase. In press. Quoted by "Varidase," Lederle Laboratories.
10. Hunt, H. B. and Breit, D. H. Physiobiology and general management of chronic ulceration occurring after irradiation. *Am. J. Roentgenol.*, 59: 9–18, 1948.
11. Johnson, A. J. Cytological studies in association with local injections of streptokinase-streptodornase into patients. *J. Clin. Investigation*, 29: 1376, 1950.
12. Kirsh, D., Mahoney, J. F. and Pendergrass, E. P. The use of radon ointment in the treatment of late irradiation ulcers. *Am. J. Med. Sc.*, 212: 395–403, 1946.
13. Kirsh, D. and Levin, H. G. The therapeutic uses of radon ointment. *Dade County M. Bull.*, June, 1951.
14. Low-Beer, B. V. A. and Stone, R. S. Treatment of late post-irradiation ulcers with radon ointment. *Radiology*, 46: 149–158, 1946.
15. Miller, J. M., Ginsberg, M., Lipin, R. J. and Long, P. H. Clinical experience with streptokinase and streptodornase. *J. A. M. A.*, 145: 620, 1951.
16. Parish, J. J. Streptokinase: a warning. *Lancet*, 1: 736, 1950.
17. Reiser, H. J., Patton, R., Roettig, L. C. The tryptic debridement of necrotic tissue. *Arch. Surg.*, 63: 568–575, 1951.
18. Sherry, S. The Local Use of Streptokinase-Streptodornase in Refractory Chronic Draining Sinuses. Forum on Fundamental Surgical Problems. Clinical Congress of Am. College of Surgeons. Philadelphia, 1951. W. B. Saunders Co.
19. Tillett, W. S. The principles involved in the clinical use of streptokinase-streptodornase. Boston, 1950. Am. College of Surgeons.
20. Tillett, W. S.: Studies on the Enzymatic Lysis of Fibrin and Inflammatory Exudates by Products of Hemolytic Streptococci. Harvey Lecture Series, 1949–1950. Springfield, Ill., 1951. Charles C Thomas.
21. Tillett, W. S. and Sherry, S. The effect in patients of streptococcal fibrinolysin (streptokinase) and streptococcal desoxyribonuclease on fibrinous, purulent and sanguineous pleural exudations. *J. Clin. Investigation*, 28: 173, 1949.
22. Tillett, W. S., Sherry, S., Christensen, L. R., Johnson, A. J. and Hazlehurst, G. Streptococcal enzymatic debridement. *Ann. Surg.*, 131: 12, 1950.
23. Uhlmann, E. and Grossman, A. The use of radon ointment as a means of differentiation between radionecrosis and recurrent carcinoma. *Am. J. Roentgenol.*, 47: 620–623, 1942.
24. Uhlmann, E. Alpha rays in the treatment of wounds. *Surg., Gynec. & Obst.*, 79: 412–418, 1944.
25. Wright, L. T., Smith, D. M., Roghman, M., Metzger, W. I. and Quash, E. T. Use of streptokinase in certain surgical conditions. *J. Internat. Coll. Surgeons*, 15: 286–298, 1951.
26. Editorial. Streptococcic enzymatic debridement. *J. A. M. A.*, 148: 288, 1952.

SOME ASPECTS OF SUPERVOLTAGE ROENTGEN THERAPY*

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As currently defined, supervoltage roentgen therapy is the treatment of disease with x-rays produced at voltages beginning at 400 kv.p. on up to 2,000 kv.p. and 22,000 kv.p. It is to be distinguished from the gamma rays of radium and atomic energy.

Briefly, this paper is concerned with the management of malignant disease with roentgen rays. X-rays are produced by the rapid deceleration of electrons within a vacuum. They are used to treat carcinoma because of their ability to ionize tissues and to penetrate tissue. This ionization or transfer of energy is responsible for the alterations in cellular morphology.

The ultimate in the treatment of cancer is its cure. Failing this, palliative or delaying measures are adopted. Radiotherapy attempts to cure by selectively destroying diseased tissue. This is done by delivering to a particular volume of tissue a predetermined dose in a given period of time. At the same time, we spare the normal structures to the best of our ability. By dose is meant that amount of ionization which occurs in a known volume during a specified period of time. To say that any one patient received so many roentgens without specifying where and how long the time required is meaningless. The roentgen then is a yardstick of quantity; it does not describe the quality of radiation. When calculated in tissue, it must be arrived at on clinical grounds from available experimental data.

There are many factors, when considered as a whole, which contribute to the proper approach to radiation therapy. They will be enumerated and applied in this discussion whenever pertinent: (1) clinical and microscopic evaluation of the tumor; (2) sensitivity of tumor to radiation; (3) quality of radiation; (4) treatment time; (5) field size; (6) depth and size of lesion; (7) number of portals used; (8) distance and filtration; (9) patient's general condition; (10) response of lesion during and after treatment.

Good therapy demands not only familiarity with its science but also a generous measure of its art. Good therapy implies a working knowledge of clinical medicine, especially pathology and surgery. This obtains regardless of the apparatus employed. Supervoltage therapy is no open sesame to the millenium. The lessons of yesterday must be applied to the problems of today and tommorrow.

It is my intention to discuss particularly the clinical aspects of this field. By way of introduction, a short sketch of the developments in this venture will be given.

The principle problem in the development of voltages greater than 200 kv.p. was the design and construction of generators and tubes capable of producing and handling such voltages. At the present time, generators and tubes for 400 kv.p. are available. Their construction does not differ from conventional deep therapy equipment.

Initially, cumbersome arrangements were necessary to house installations greater than 400 kv.p. The enormous size of the tubes and the amount of free air required to insulate the generators contributed to this awkwardness. Furthermore, nearly all the tubes needed continuous evacuation. There are some of this design still in operation.[13,14] Their chief disadvantage is a general unwieldiness of operation associated with a fixed target mounting.

Eventually, newer designs in generators, tubes, materials and insulation have contributed to the growth of units which are compact and flexible.

In our private office since 1937 we have used a 400 kv.p. constant potential generator with a sealed tube immersed in oil. It operates at 5 ma., target current, and has a half value layer of 5.0 mm. copper. By way of explanation, the half value layer is a label of x-ray quality. It tells us the number of thicknesses of a particular material necessary to reduce the primary beam to 50 per cent of its maximum intensity. (Compare 200 kv.p.-h.v.l. of 0.9

* Delivered in February, 1952, before a combined staff meeting at Murphy Army Hospital, Waltham, Mass.

copper with the foregoing.) Although at 10 cm. the percentage depth dose is not appreciably greater than with 200 or 250 kv.p., it allows a greater over-all dose to be delivered because of an increase in skin tolerance. It is a dependable and flexible machine requiring little servicing.[1,2]

Van de Graaff in 1933[5] and Van de Graaff and Trump in 1937[6] described an electrostatic generator for the high speed acceleration of electrons. This is a most unique unit combining flexibility and economy of size without affecting radiation quality. A multisectional tube is contained within a steel tank insulated with compressed air. The tube is constantly evacuated with a mercury diffusion pumping system. It operates at target current between 0–500 microamperes. At 2,000 kv.p. and the conventional treatment distance of 100 cm. the output is 70 roentgens as measured in air. The half value layer in copper is 13 mm. At 10 cm. in a pressed-wood phantom using a 10 by 10 cm. field the percentage depth dose is around 56 per cent. The level of maximum ionization is between 2 and 3 mm. below the surface. Backscatter contributes about 7 to 9 per cent to the skin dose. (Compare with 36 per cent for 200 kv.p.-h.v.l. of 0.9 Cu.)

Charlton and Westendorp in 1940[3] and again in 1944,[4] described an electromagnetic generator consisting of a low frequency resonance transformer with a coaxially mounted sealed-off tube within, both contained within a steel tank insulated with compressed gas. The x-rays are generated at a target mounted in the end of an extension chamber at the end of the tank. This unit has been developed for 1,000 and 2,000 kv.p.

Kerst in 1940[27] introduced the betatron for the multiple acceleration of electrons producing x-rays of 20,000 to 30,000 kv.p. The greatest intensity of the primary beam is 4 cm. below the skin's surface. The exit dose at 18 cm. is around 60 per cent.[10]

Realizing the improvements in the treatment of malignant disease since Coutard showed the way, it was believed by some[2,13,14,19,21] that a further increase from 200 kv.p. might cure more cancer.

The two outstanding characteristics of ultra-high voltage are an increase in skin tolerance and an increased percentage depth dose.[19,24]

The increased skin tolerance[9,15] is mainly due to high speed, high energy photons which produce in tissue long range supercharged secondary electrons. These electrons require tissue density greater than their mean range before ionization is complete. This cannot occur at the surface. Since ionization is responsible for the changes we observe, its deficiency on the skin readily explains this first physical characteristic. The equilibrium reaction occurs 2 to 3 mm. below the surface. This small surface dose gradually becomes less a factor as field size increases.

Penetration is an inherent property of ionizing radiation and increases with the voltage applied. This will explain the increase in depth dose.

A third characteristic is a minimum of tangential and circumferential scattering. Almost all scatter is in a forward direction. This improves the useful beam. It yields a more geometric path of ionization at the same time sparing to a greater degree intervening normal tissue.

A word of caution: The skin is no longer a limiting factor. Clinical judgment and deep tissue reaction, especially in mucous membrane, must be our guides. If a crossfire technic is used, the increase in the exit dose must be considered.

Lastly, protection factors especially within the limits of the useful beam are going to be totally different. No longer will a thin strip of lead rubber or a few millimeters of lead be sufficient to protect the patient. The protection of personnel and adjoining rooms also presents a new problem.

Acknowledging the superior physical properties of supervoltage roentgen rays, it remains to assess their value to the therapist and his patient. The common denominator here as with any mode of cancer treatment is the response of the tumor. This is known as the biologic effect. In radiation therapy this is produced as the x-rays interact with matter. More precisely, it is the number of roentgens which are absorbed in a given volume of tissue over a stated period of time. It is the cellular alteration which takes place in this tissue. Is this reaction or is the clinical result with 2,000 kv.p. going to differ from that observed with 200 kv.p., assuming an equal dose in each instance?

True this aspect is surrounded by many nebulous theories such as tumor sensitivity, patient idiosyncrasy and our own inability to plumb the depths of what is and what is not

a cancerocidal dose. Fundamentally, however, it will decide the position of supervoltage therapy in cancer work. Trump[12] and others[1,9,13] believe that the biologic effect is the same below the surface of the skin up to a quality of 15 mm. Cu, h.v.l., which is equivalent to 3 mev.[30] Theoretically, then, supervoltage x-rays hold no advantage in tumor response. However, with greater doses being delivered to tumors hitherto considered radioresistant, the outcome may possibly be more successful.

Supervoltage radiation in 1939 was thought by Dresser to be in the same stage of development as was deep therapy fifteen years before.[2] Twelve years have passed since this statement and only a few[13,25] to my knowledge have reported five year end results with this new method. Phillips[14] in England using a 1,000 kv.p. generator could not notice any particular improvement in end results. In pelvic cases edema and fibrosis were still troublesome. Buschke, Cantril and Parker[13] using 800 kv.p. were unable to notice any improvement. They warn against the hazards of overirradiation in the absence of visible skin reactions. Jones[16] reports severe reactions in the mucous membrane, particularly the bladder, at 1,000 kv.p. Williams[28] at 1,000 kv.p. thought that the results in the management of carcinoma of the antrum, bladder and rectum were superior to conventional deep therapy. Costolow[20] at 500 kv.p. believes that the results in the late stages of carcinoma of the cervix were improved over those seen with deep therapy. Leucutia[21] believed that at 500–600 kv.p. selected cases, especially of the deep-seated variety, were helped. Schulz[25] after eight years' experience with 1,000 kv.p. states that no real advantage accrues from supervoltage as far as curing a greater number of patients is concerned. Murphy and Reinhard[17] reported on a selected group of 185 patients with carcinoma of the cervix uteri; ninety-six patients were treated with 200 kv.p. and eighty-nine patients with 1,000 kv.p. There was a three-year survival rate of 58.5 per cent against a rate of 45.6 per cent for the group managed with deep therapy.

No significant improvement has been noted in the over-all survival rate. There is no question that supervoltage treatment offers selected patients a chance for increased survival. This is particularly true for deeply seated, localized malignancy, especially lesions which are known to be radiosensitive.

We must also know whether supervoltage will produce in tissues the changes peculiar to ionizing radiation namely, erythema, tanning, telangiectasis, fibrosis, edema, endarteritis obliterans and atrophy. There is no question as one scans the literature[13,18,20,23,26] that these reactions occur. They should occur infrequently. Those with experience with this new method have learned that as with 200 kv.p. there are certain limits beyond which trouble appears. They observe this limitation. Dresser and others have noted the reaction in mucous membrane to be more severe than with conventional treatment. Schulz[33] warns against the skin damage which appears late in the post-treatment phase and requires a longer recuperative period. Stone[12] cautions against overtreatment for "just as much damage can be done to the skin if enough dosage is delivered."

Thirdly, as with deep therapy, the triad of field size, filtration and distance will affect ultrahigh roentgen treatment as with other qualities of radiation.[24]

A word must be said as to complications other than those on the skin. Amory and Brick[18] report eleven cases of severe intestinal damage occurring in the course of the treatment of retroperitoneal metastases in carcinoma of the testicle. These patients received a measured dose (level of transverse colon and cecum) of 6,000 to 6,750 r in fifty days; 1 mev with 10 by 15 anterior and posterior fields with air doses of 400–600 r to each field daily. All these patients died and at autopsy were found to have severe mucosal and soft tissue changes. All clinically presented symptoms of small or large bowel embarrassment.

Greenfield and Stark[26] report on three patients of 180 in whom a muscular weakness of the lower motor neuron type without sensory changes developed within the lower extremities. This occurred in patients receiving treatment to the retroperitoneal nodes following surgery for carcinoma of the testicle. Four portals, two anterior and two posterior, were used. Each port received a total skin dose of 5,400 r. This resulted in a dose at the level of the lower dorsal and lower lumbar spine of 4,300 to 6,500 roentgens. This damage was permanent. Before leaving the subject, the work of Trump and Hare demands consideration.

To my mind the combination of a supervoltage beam with a core of ionization is the ultimate in technical perfection.

ROTATION THERAPY

In order to increase the amount of ionizing radiation delivered to a given tumor, particularly those deeply seated, many portals of entry are used. This allows a concentration of the many primary beams at the tumor site at the same time reducing damage to the skin. This technic has been variously called cross-firing or multiple small beam therapy and is very satisfactory provided the number of sites of entry are four or less and some thought has been given to treatment planning. However, when more than four fields are employed, it becomes almost technically impossible to reproduce the physical setup no matter how great is the control of the patient. Even when using light defining mechanisms built into so many of the present day machines there is the very real danger of "hot spots" and poor centering.

Furthermore, if ultrahigh voltages of one and two million volts are used, cross-firing particularly may be hazardous due to the high exit dosages characteristic of these wave lengths.

Nielsen and others[31] working with 200 kv.p. carried the idea of multiple small field therapy to its ultimate refinement. They rotated a patient about an axis perpendicular to the plane of the primary treatment beam. This allowed them to deliver to a lesion in the thoracic esophagus a dose almost 50 per cent again as large in the same period of time as was given with a technic using multiple fields. Since this initial effort, this group has treated many more cases of carcinoma of the esophagus. Although there have been no five-year cures, this new method enabled the authors to increase their survival rate at the end of the first year by 20 per cent and the figures at the end of the second year by 15 per cent. They have four patients surviving at the end of four years. This, I believe, is all the more remarkable since the authors are using potentials in the range of 180–200 kv.p., the half value layer being 0.3 mm. of Cu. The question is asked how much more might be expected were this rotation to be combined with a beam of irradiation more powerful and useful by a factor of forty.

Rotation further enhances the qualities of supervoltage by virtue of its reduction in the damage to the skin and intervening tissues. Therefore, this combination if properly understood should allow the therapist to deliver to a certain group of tumors doses of irradiation previously unattainable in comparable periods of time. It would seem ideally suited to treatment of midline deeply situated lesions such as the esophagus, mediastinum, pituitary, nasopharynx, hypopharynx, bladder and perhaps the cervix.

Tissue dose is calculated as with any other method employing irradiation. The 100 per cent zone instead of being measured at the skin's surface is measured at the center of rotation and is known as the "axis air dose." This is a distance of 122.5 cm. away from the target. Estimation of tissue dose or axis tumor dose is made on cross section charts drawn to scale and superimposed on a 360 degree circle. The dose to any given point in or about the tumor site is calculated considering the portals of entry as discontinuous. The contribution of each of these fields is summated yielding the true estimate of the delivered dose. For example, a lesion in the esophagus to be treated where the patient is 20 cm. in the anterio-posterior diameter and 28 cm. from side to side will receive a tumor dose of between 5,000 and 6,000 r within a period of forty to fifty days without any damage to the skin. There should be no appreciable damage to the lungs since the portal used is quite narrow (10 by 6). The dose to any portion of the skin in this case, which would require an air dose of at least 8,500 to 10,000 r, will be about 60 r total.

It must be re-emphasized that despite rotation and ultrahigh voltage unless attention is paid to the distribution of ionizing radiation in the tissues, especially significant with this newer method, unpresaged trouble may occur.

COMMENT

There is no definitive clinical proof to date that supervoltage roentgen therapy will replace conventional 200 or 400 kv.p. management. The ability to deliver to deeply seated tumors a greater dose with a smaller number of fields will undoubtedly offer to a selected group of cancer patients a chance of a cure. It would seem to be particularly well suited for the management of midline, deeply seated and bulky lesions. Its use in the treatment of patients whose skin is too damaged to tolerate long wave length exposure is important.

It must be acknowledged that to date most clinics are dealing with patients whose cure potential is low. In the years to come some

may be able to report on a statistically significant group of curable cases. Rotation therapy at supervoltage levels would seem to offer even more clinically than multiple field or single field ultrahigh voltage therapy.

Radiation therapy is an exacting mistress. There are many feathers in her cap. That it is of unquestioned value in the cure and palliation of cancer can no longer be denied by the informed physician and surgeon. It remains for us to continue our research in physics, biology and clinical medicine to insure further progress in radiation therapy.

SUMMARY

1. Supervoltage roentgen therapy is defined.
2. Compact and flexible units are currently being manufactured.
3. A lowered ion density on the surface, increased penetrability and forward scattering are the principal physical properties.
4. Increased skin tolerance and increased percentage depth dose are the chief clinical characteristics.
5. A brief summary of the results of others is given.
6. Radiation damage does occur and this is particularly troublesome in the deeper structures.
7. Rotation therapy is briefly discussed.

REFERENCES

1. O'Brien, F. W. Supervoltage x-ray therapy. *Am. J. Surg.*, 39: 95–99, 1938.
2. O'Brien, F. W. The x-ray treatment of cancer in small communities. *New England J. Med.*, 220: 459–462, 1939.
3. Charlton, E. E., Westendorp, W. F., Dempster, L. E. and Hotaling, G. A million volt x-ray unit. *Radiology*, 35: 585–596, 1940.
4. Charlton, E. E. and Westendorp, W. F. Two million volt mobile x-ray unit. Proceedings of the First National Electronics Conference, October, 1944.
5. Van de Graaff, R. J., Compton, K. T. and Van Alta, C. L. Electrostatic production of high voltages for nuclear investigation. *Physiotherapy Rev.*, 43: 149, 1933.
6. Van der Graaf, R. J. and Trump, J. G. Design of a million volt x-ray generator for cancer treatment and research. *J. Appl. Physiol.*, 8: 604, 1937.
7. Trump, J. G. and Van de Graaff, R. J. A compact pressure-insulated electrostatic x-ray generator. *Physiotherapy Rev.*, 55: 1160–1165, 1939.
8. Van de Graaff, R. J., Trump, J. G. and Beuchner, W. W. Electrostatic generators for the acceleration of charged particles. *Reports on the progress in physics*, 11: 1–18, 1948.
9. Howarth, J. L., Jones, T. C. and Miller, H. Physical measurements on a 2 mev. x-ray generator. *Brit. J. Radiol.*, 24: 665, 1951.
10. Johns, H. E., Darby, E. K. and Kornelsen, R. Q. The physical aspects of treatment of cancer by 22 mev. x-rays. *Brit. J. Radiol.*, 24: 355, 1951.
11. Spiers, F. W. Dosage in irradiated soft tissue and bone. *Brit. J. Radiol.*, 24: 365, 1951.
12. Hare, H. F. et al. Supervoltage rotation therapy. *Radiology*, 57: 157, 1951. Discussion by Stone, R. S.
13. Buschke, F., Cantril, S. T. and Parker, H. M. Supervoltage Roentgen Therapy, 1st ed. Springfield, Ill., 1950. Charles C Thomas, Publisher.
14. Phillips, R. Supervoltage X-ray Therapy. London, 1944. H. K. Lewis & Co., Ltd.
15. Trump, J. G. Physical basis for the high skin tolerance of supervoltage roentgen rays. *Radiology*, 50: 649, 1948.
16. Jones, G. S. Clinical reactions and injuries in supervoltage therapy. *Proc. Roy. Soc. Med.*, 41: 703–709, 1948.
17. Murphy, W. T. and Reinhard, M. C. Some observations with 1,000, 400 and 200 kv.p. x-ray therapy. *Radiology*, 55: 477, 1950.
18. Amory, H. I. and Brick, I. B. Irradiation damage of intestines following 1,000 kv.p. roentgen therapy. Evaluation of tolerance dose. *Radiology*, 56: 49, 1951.
19. Dresser, R. J., Rude, J. and Cosman, B. J. The differences between 200 and supervoltage therapy. *Radiology*, 34: 12–16, 1940.
20. Costolow, W. E. Clinical aspects of supervoltage roentgen therapy in cancer. *Radiology*, 34: 28–33, 1940.
21. Leucutia, T. Late results in supervoltage roentgen therapy. *Am. J. Roentgenol.*, 44: 586, 1940.
22. Leucutia, T. and Korrigan, K. E. Further developments in supervoltage apparatus. *Radiology*, 27: 208, 1936.
23. Stone, R. S. and Robinson, J. M. A comparison of skin reactions produced by 200 and 1,000 kv.p. radiations. *Am. J. Roentgenol.*, 44: 601, 1940.
24. Trump, J. G. and Cloud, R. W. Physical characteristics of supervoltage roentgen rays. *Am. J. Roentgenol.*, 44: 615, 1940.
25. Holmes, G. W. and Schulz, M. D. Supervoltage radiation (1937–1944). *Am. J. Roentgenol.*, 55: 533, 1946.
26. Greenfield, M. M. and Stark, F. W. Post-irradiation neuropathy. *Am. J. Roentgenol.*, 60: 617–622 1948.
27. Kerst, D. W. Acceleration of electrons by magnetic induction. *Physiotherapy Rev.*, 60: 47, 1941.
28. Williams, I. G. Million volt x-ray therapy. *Proc. Roy. Soc. Med.*, 41: 709–718, 1948.
29. Glasser, O., Quimby, E. H., Taylor, L. S. and Weatherwax, J. L. Physical Foundations of Radiology. 1st ed. New York, 1944. Paul B. Hoeber.
30. Evans, W. W., M. S. Personal communication.
31. Nielson, J. Clinical results with rotation therapy in cancer of esophagus; preliminary report based on 174 cases. *Acta radiol.*, 27: 361, 1945.
32. Krebs, C., Nielsen, H. and Anderson, P. Rotation therapy of cancer of esophagus. *Acta radiol.*, 32: 304, 1949.
33. Holmes, G. W. and Schulz, M. D. Therapeutic Radiology. Philadelphia, 1950. Lea & Febiger.

RELATIONSHIP OF GONADAL IMBALANCE TO THYROID DISEASE*

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THE purpose of this study is to determine the statistical relationship of gonadal dysfunction and imbalance to the incidence of thyroid disease, covering a five-year period from 1945 to 1949 inclusive. Four hundred sixty-seven cases were reviewed, omitting twenty-nine cases, in which the presence of thyroid disease was not definitely established. This latter group included adenomas of the thyroid found at autopsy in cases of advanced heart disease, pneumonia, nephritis, diabetic coma and fractures. Whenever the history or clinical picture did not substantiate the diagnosis of thyroid dysfunction, it was not accepted.

In the group reviewed are included cases of non-toxic adenoma, simple adenoma, toxic adenoma, diffuse hyperplasia, carcinoma, hypothyroidism, thyroglossal duct cyst and thyroiditis.

SEX, AGE AND MARITAL STATUS IN PATIENTS WITH THYROID DISEASE

In the present study there is approximately a 6.5:1 ratio of female to male patients (393 or 84.2 per cent to 74 or 15.8 per cent). (Fig. 1.) This ratio does not vary remarkably in the various categories. It significantly emphasizes the well known sex-linked incidence of thyroid disease in the female in non-endemic goiter areas. Thyroid disease was observed in the married, separated and widowed, taken collectively 4.5 times as frequently as in the single patients (78.6 per cent:21.4 per cent). About one-third of the males were single and less than one-quarter had any progeny.

Age, as noted in Figure 1, represents that at the time of admission to the hospital for the care of the thyroid condition. The greatest incidence occurred between the ages of thirty and sixty (65.3 per cent) with the "peak" age between forty and fifty years (26.3 per cent).

GONADAL INVOLVEMENT IN PATIENTS WITH THYROID DISEASE

Gonadal involvement has been arbitrarily subdivided into three large groups, as indicated by antecedent gonadal pathology, abnormal menses and hysterectomy. (Fig. 2.)

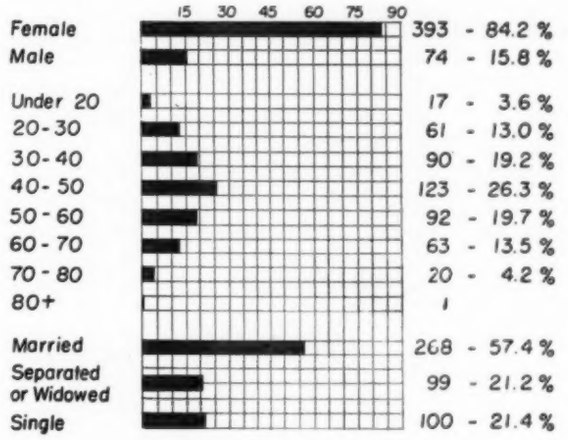

FIG. 1.

The "observed gonadal pathology group" (180 cases or 38.5 per cent) was constituted by those cases with a definite history of mastitis, or of tubal, ovarian or uterine disease in the female, and prostatism, undescended testicle, inguinal hernia, mastitis, castration and absence of secondary sex characteristics in the male. (Fig. 2.) Diseases which frequently have been secondarily believed to be related to alterations in gonadal activity, such as gastric ulcer, acne, sinusitis, impotence, asthma, arthritis and nervous breakdown were not included. We consider the observed percentage of 38.5 a conservative one, because no record of pelvic examination was made in 38 of the 393 women included in this study.

In the "abnormal menses group" (104 cases or 22.2 per cent) are included only those cases with a definite history of irregularity of the

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menstrual cycle or those in whom drastic change in menstruation was noted, such as menorrhagia not associated with demonstrable pelvic disease. Patients with postpartum irregularities of menstruation, those with severe dysmenorrhea or sterility and those in whom

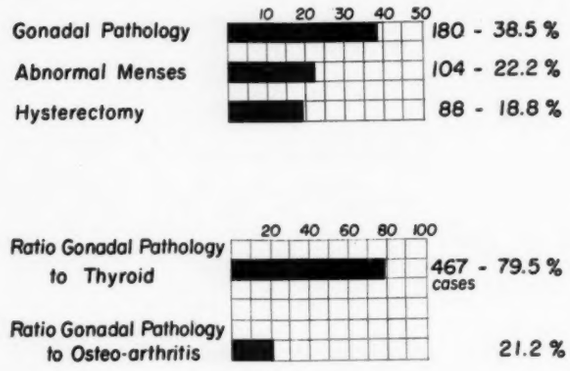

FIG. 2.

cyclic changes could be attributed to a menopausal syndrome were not included. The observed correlation of 22.2 per cent between pelvic and thyroid disease is therefore a very conservative one, more so because of the 393 women with thyroid disease, included in this study, menses were recorded as "regular" or not mentioned at all in forty-four.

Little explanation of the "hysterectomy group" (eighty-eight or 18.8 per cent) is necessary. (Fig. 2.) There was a wide variation of elapsed time between the pelvic surgery and the onset of thyroid disease. The shortest time was six months and the longest twenty-six years with an average of five years. Three patients suffered concomitantly from "fibroids" of the uterus and hyperthyroidism. In each of these successful extirpation of both organs was accomplished during the one hospitalization with no apparent ill effects or complications either immediately or during a three-year period of "follow-up."

When we combine these three sub-groups as a whole, it is noted that 79.5 per cent of the total of 467 cases (4:5 ratio), had an antecedent history of gonadal involvement. The ratio of gonadal disorders to admissions for osteo-arthritis was 21.2 per cent or a 1 to 5 ratio. Osteo-arthritis was selected arbitrarily for comparison so as to evaluate conclusively the relationship of gonadal disturbance to another disease not too closely associated with the endocrine system. The difference in these ratios is highly significant, statistically, and shows that the association of pelvic disease with thyroid disease is not a matter of chance alone.

INCIDENCE OF GONADAL DISTURBANCE AND PELVIC SURGERY IN THYROID DISEASE

The classification of thyroid disease is derived from both pathologic descriptions and clinical findings, mainly in order to simplify the categories used in delineating causal relationships to pelvic disease.

The non-toxic adenomas (186 cases or 39.7 per cent) represent the largest group. (Fig. 3.) Of these 163 or 87.6 per cent, had some antecedent gonadal disturbance. They also represent the largest percentage of the total number of cases, 34.9 per cent or about one-third.

The simple adenomas (thirty-four cases or 7.2 per cent) constitute a small group but the percentage with antecedent gonadal disorders (85.3 per cent) is as high as that observed in patients with non-toxic adenomas.

The toxic adenomas (126 cases or 26.9 per cent) comprise about one-quarter of the total cases reviewed and antecedent gonadal disease was revealed in 78.4 per cent of the cases. Hysterectomy was performed almost twice as frequently and gonadal disease was observed almost twice as often in those with non-toxic adenomas as compared with those with toxic nodular thyroid glands. The incidence of abnormal menstruation is practically the same for the two groups.

Graves' disease was noted in forty-one cases or 8.7 per cent of the total number of cases accepted for study. Here, also, the percentage of antecedent gonadal disorders was high (78.0 per cent).

Carcinoma of the thyroid was present in less than 10 per cent of the total number of cases analyzed (thirty-four cases or 7.2 per cent); twenty-seven were female and seven were male, or a ratio of about 4:1, which approximates the over-all ratio for the series. Of this group only 44.1 per cent gave a definite history of gonadal disease.

About one-fifth (18.4 per cent) of all our patients had had previous operations and one woman had been operated upon twice for "toxic adenoma" and a third time for malignancy.

The diagnosis of carcinoma of the thyroid was made preoperatively in all but three of the fifteen patients. Nearly one-half (45.1 per cent) of the group with carcinoma had had symptoms referable to the thyroid of less than one year's

duration, while one-third (31.2 per cent) had some sign or symptom which had existed for five years or more. The shortest duration of symptoms was three weeks and the longest fifteen years.

Under the diagnosis, hypothyroidism, we have included all cases of myxedema so that this group comprises twenty-six cases or 5.5 per cent of the total reviewed. It is significant that here, too, the percentage of antecedent gonadal disease was found to be high (88.0 per cent) approximating the total averaged figure of coincidence.

Thyroglossal duct cyst was present in thirteen patients or 2.7 per cent of the total. Again, the incidence of gonadal disorders was relatively high (46.1 per cent) particularly when it is realized that four of these patients were under ten years of age.

In thyroiditis (seven cases or 1.5 per cent) there was also a high antecedent incidence of gonadal disturbance (85.7 per cent).

In the present series of 467 cases of thyroid disease, twenty-eight or 5.8 per cent expired during the period of hospitalization covered by the present study; 39.4 per cent of these died of thyroid carcinoma or its sequelae. Two patients died on the operating table; one had a thyroid malignancy and the other, multiple adenomas of the thyroid. The youngest was a female, twenty-eight years old and the oldest a female, eighty-one years of age.

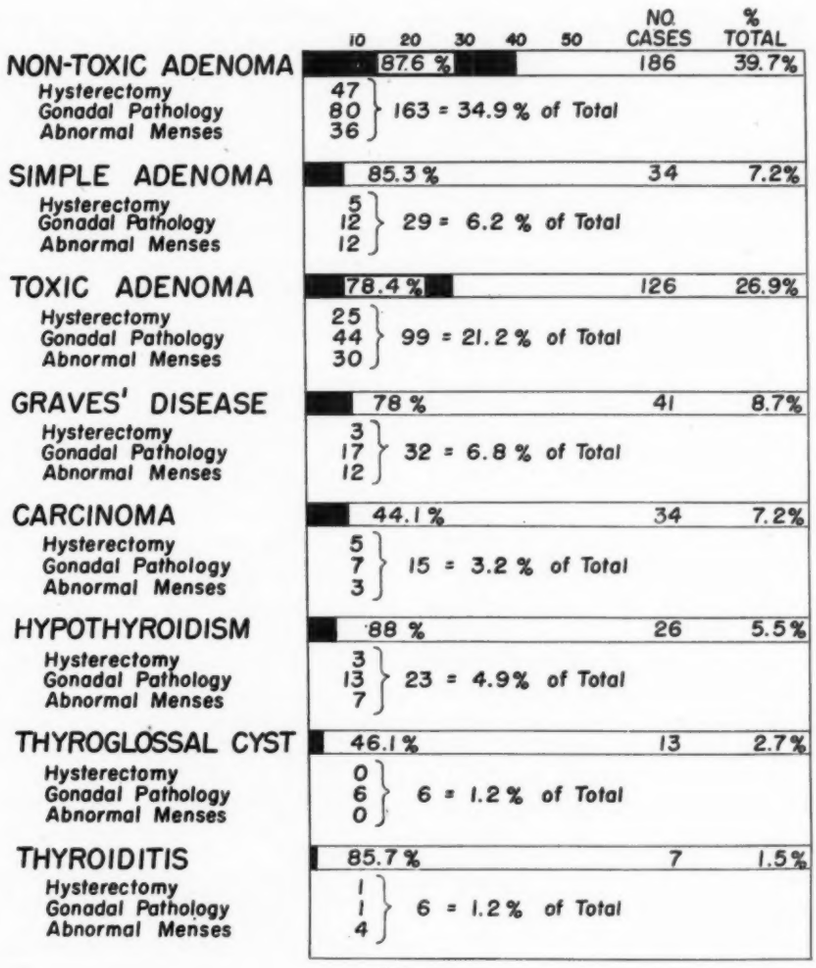

FIG. 3.

COMMENT

That the thyroid and the gonads are functionally interrelated has been recognized for a considerable period of time. Furthermore, it appears that thyroid disease is more liable to

follow than to precede disturbances in the genital tract. "Cyclic variations in the basal metabolic rate, with various phases of the menstrual cycle alone, serve to emphasize the close association between the thyroid and the ovary."[1] Administration of thyroid hormone improves the function of the gonad in partially or completely castrated animals. It has been shown[2] that thyroid hormone in small doses directly increases the gonadotropic content of the pituitary, thereby improving indirectly some of the disorders affecting the reproductive tract. On the other hand, thyroid hormone may decrease the gonadal response to a given quantity of gonadotrophic extract.[3] "It appears to take relatively little thyroid hormone to maintain a reasonably satisfactory balance between the pituitary and the gonad, so that only at the extremes of thyroid hormone production do we see clinically recognizable disturbances in the function of the ovary and the testis."[1]

The influence of the gonad on the thyroid has been shown principally by castration and by estrogen administration in various doses.[4] Thyroid function is definitely depressed when large doses of estrogen are used,[5] whereas in physiologic doses the activity of the thyroid is stimulated.[6]

These experiments indicate an interrelationship between the thyroid, the pituitary and the gonads. Whether the pathways for these relationships also involve the adrenal or the hypothalamus is conjectural at this point. It seems logical to assume, however, that the pituitary plays a most important role. At least, such a hypothesis has justifiable foundation in experimental data.[1]

From the present study it is apparent that in individuals who have had genital tract dysfunction the possibility of thyroid disease becoming manifest at a later date must be kept constantly in mind. Following castration, hysterectomy, or any other pelvic disease or gonadal surgery, the patient should be under periodic surveillance, so that gonadal replacement or substitution therapy in proper physiologic doses may prevent the appearance of disturbances in thyroid function and form as well as the complications that may arise therefrom. A more than coincidental relationship between thyroid disease and pelvic disorders has here been demonstrated. An appeal is made to utilize this relationship by studying the over-all endocrine balance of each patient with a disorder of the genital tract in such a manner that early rational endocrine therapy may lead to the restoration and maintenance of normal bodily function. Consultation and cooperation between the gynecologist and endocrinologist is always advisable and imperative.

SUMMARY

Four hundred sixty-seven cases of thyroid disease admitted to two general hospitals over a period of five years (1945 to 1949), are reviewed from the standpoint of antecedent gonadal disturbance and its relationship to the etiology of the thyroid disease. In approximately four-fifths of these cases (79.5 per cent) such a relationship could be demonstrated. The actual percentages for several specific conditions were as follows: non-toxic adenoma 87.6; simple adenoma 85.3; toxic adenoma 78.4; diffuse hyperplasia 78; hypothyroidism 88.0; thyroiditis 85.7; carcinoma 44.1; thyroglossal duct cyst 46.1.

REFERENCES

1. McGavack, T. H. The Thyroid. St. Louis, 1951 C. V. Mosby.
2. (*a*) Evans, H. M. and Simpson, M. E. Different effects secured from intraperitoneal as contrasted with subcutaneous administration of the anterior-hypophyseal hormones. *Anat. Rec.*, 45: 215, 1930. (*b*) Chu, J. P. and You, S. S. Role of thyroid gland and oestrogen in regulation of gonadotrophic activity of anterior pituitary. *Endocrinology*, 4: 115, 1945.
3. Hoffman, J. Female Endocrinology. Philadelphia, 1944. W. B. Saunders Co.
4. Sherwood, T. C. and Bowers, L. M. Effect of ovarian hormone on basal metabolism of experimental hyperthyroid rats. *Am. J. Physiol.*, 115: 645, 1936.
5. Gardner, J. H. Effects of inunction of alpha-estradiol on testes and thyroids of albino rats. *Proc. Soc. Exper. Biol. & Med.*, 72: 306, 1949.
6. Nathanson, I. T., Brues, A. M. and Rawson, R. W. Effect of testosterone propionate upon thyroid and parathyroid glands of intact immature female rat. *Proc. Soc. Exper. Biol. & Med.*, 43: 737, 1940.

NON-TROPICAL SPRUE-LIKE SYNDROME CAUSED BY A DILATED POUCH FOLLOWING SIDE-TO-SIDE ANASTOMOSIS*

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NON-TROPICAL sprue is a condition characterized by diarrhea, steatorrhea and other gastrointestinal symptoms, macrocytic anemia, glossitis, nutritional manifestation including loss of weight, weakness, hypocalcemia, osteoporosis, tetany, hypoproteinemia, edema and other changes. These vary from case to case. The disease is characterized by a chronic progressive course and often prolonged remissions. Steatorrhea (idiopathic) and celiac disease give a similar picture. Folic acid seems to help steatorrhea and sprue in some cases but not celiac disease.[13] The fundamental defect in sprue is considered to be impaired absorption of various substances from the gastrointestinal tract. It was noted that these patients have low vitamin A and cortin levels.

The picture of chronic diarrhea or attacks of diarrhea with anemia is found frequently in surgical conditions. Gastrocolic fistula, resection of a third to a half of the bowel, pancreatic disease, regional enteritis, postoperative gastric resection and other conditions may show the aforementioned syndrome. The differentiation from the medical sprue-like syndrome is usually not difficult and in cases with advanced enteritis or with large resection is self-evident.

Recent experience with a case presenting a sprue-like syndrome following resection of only 5 feet of terminal ileum for acute strangulation indicated that the presence of a blind loop or pouch following side-to-side anastomosis may also be a cause.

CASE REPORT

A forty-two year old woman was admitted to Binghamton City Hospital, October 12, 1950, because of loss of weight (22 pounds), persistent diarrhea of three weeks' duration and general weakness. She had had a resection of about 5 feet of the terminal ileum with side-to-side antiperistaltic ileotransverse colostomy in 1948 because of infarction of bowel due to adhesions. A two-stage procedure had been necessitated due to her critical condition at the initial operation. She had had a thyroidectomy at the age of twenty-three, and a hysterectomy in 1943. Prior to the admission in 1948 she had had fat intolerance and increasing constipation. Initially, since her final discharge from the hospital, September 22, 1948, she had been much improved. Her red blood count at the time was 4,880,000 with 81 per cent hemoglobin. She had three to five stools daily, semi-solid in nature. She still had marked intolerance to fat and subsequently chronic anemia developed for which she had various iron, folic acid, liver and vitamin treatments with only temporary relief. She had also been treated with sulfa drugs and aureomycin without effect. Because of the type and character of the stools pancreatin had been tried without much benefit. The patient noted that she caught cold easily and that these attacks persisted much longer than prior to the resection. She specifically noted that each cold was accompanied with a flare-up in the diarrhea and that this subsided as her general condition improved. She stated that undigested food was often present in her stool. The attacks of diarrhea had become increasingly severe and persistent and were accompanied with abdominal pain. She noted that the pain followed a certain sequence. When the pain began, a mass always appeared near the operative scar. This became larger until it was the size of a small apple and was exquisitely tender to touch and pressure. The pain would increase until suddenly the mass "broke" and disappeared, following which she was quite comfortable. The attacks came on several times a day, and at times were almost constant. For the past three weeks the pain and diarrhea had been almost continuous despite all medication. She had a gastrointestinal series in April, 1950, which was reported as negative.

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FIG. 1. Postevacuation barium enema, with arrow pointing to dilated pouch. The difference in caliber between the dilated pouch and the connection with the bowel is evident.

A red blood count showed 3,740,000 red cells, and a hemoglobin of 78 per cent, with a color index of 1. Physical examination was essentially negative aside from soreness in the operative area. When the patient was seen during an acute attack, a loop of what seemed to be distended bowel could be felt. On October 13th the hemoglobin was 61 per cent with 3,260,000 reds and a color index of 0.9. She was having ten to fifteen bowel movements a day accompanied with rectal tenesmus. A barium enema report was as follows: radiographic examination showed an enterocolostomy procedure. The loops of small bowel were considerably dilated and where the small bowel has been closed off there was a rather bulbous dilation. Diagnosis was enterocolostomy procedure; otherwise negative colon. (Fig. 1.) At operation a dilated portion of ileum at the anastomosis was found 6½ cm. in diameter. It was adherent to the colon but was freed up and resected without difficulty. The anastomosis was of good caliber and showed no abnormalities. Resection of the anastomosis was therefore not thought to be indicated. Pathologic report revealed a pouch of small bowel 6.5 by 5 cm. with an opening at one end, 2.5 cm. in diameter. On section specimen showed a thickened wall. The distal closed portion contained a secondary pocket 2.5 by 3 cm. with a 1 cm. opening into the main pouch. The mucosa showed some congestion. Microscopically, much congestion and mild inflammation was seen in the mucosa. Muscularis showed fibrous thickening with diffuse calcium deposits; mild diverticulitis, probably recurrent.

The patient was last seen on May 20, 1952. She stated that she has been having one or two bowel movements a day without any abdominal distress. In contrast to her previous diarrhea there is now a tendency toward constipation. Her general physical condition has been excellent and she noted that when she does catch cold she throws it off without difficulty. She still avoids fatty or fried foods, although she has no definite intolerance to them at present. Her weight is 113 pounds which is 10 pounds below her best weight. She has an excellent appetite and eats well. Her physician states that her present weight is due to her desire rather than to any organic condition. She has had no medication for anemia and her present blood count is perfectly normal.

The production of a blind loop by having the proximal end of a side-to-side anastomosis extend beyond the opening was done by Pearse[8] in 1934. He proved in dogs that such dilatation caused symptoms only if peristalsis was in the direction of the loop. In these cases material is forced into the loop by peristalsis producing distention and varying symptoms depending upon the size and the position of the loop. The symptoms came on in from two to four months postoperatively and could be placed in two categories: (1) those due to pressure symptoms caused by increase in size and/or due to interference with circulation causing perforation and peritonitis; and (2), those producing systemic effects the cause of which are not clearly understood. This article has to do with the second type.

In all cases the first sign was diminution of appetite, with progressive weakness, lethargy and loss of weight. The animal appeared thin, listless and weak as the emaciation became more marked. The eyes were sunken and dull. There was no vomiting. Diarrhea occurred only at infrequent intervals in a few instances but all had loud rumblings in the abdomen. Unless the loop (jejunum, 3 to 4 feet) was resected, these animals died. Loops of 1 foot or less cause no harm.

Those of 2 feet cause no symptoms except when dilatation caused perforation and peritonitis with death. Loops of ileum cause no symptoms. There were no abnormal blood chemistry changes. Examination of these dogs with barium was instructive.

"Under the fluoroscope barium is carried up the blind end which becomes dilated. The dilatation increases as wave upon wave drives the material into this cul de sac. After a variable period of time the peristaltic action becomes feeble and finally ceases. With this the barium flows back through the loop, the dilated blind end resumes its former size and the remainder of the segment fills. . . . Some of the barium spills over through the anastomosis into the distal intestine. . . . At the end of a week, all the barium had been eliminated from the segment." Pearse noted that resection of these loops caused recovery whereas death resulted otherwise.

Pearse mentioned a case report by Little, Zerfas and Trusler in which eight years after enteroanastomosis and four years after the onset of nutritional disturbances, pernicious anemia developed. He suggested that the reason he did not see these changes in his dogs was because of the shortness of the time observed.

W. Richardson[10] reported a case with chronic diarrhea and the blood picture of pernicious anemia due to short-circuiting of half the small bowel. Restoring the continuity of the bowel cured both the diarrhea and the abnormal blood picture.

Watson, Cameron and Witts[12] produced macrocytic anemia in the rat by the formation of a blind loop of jejunum similar to that done by Pearse in dogs. They produced the syndrome by as little as a 3-inch loop which is equivalent to about 2 to 3 feet in humans (estimated 36 inches length of bowel in rats). When long loops were used, the mortality was 75 per cent in three weeks and the disturbances so extensive that medical treatment could not save the animals. The anemia usually progressed rapidly if untreated and the rat died in about a month. It was noted in these experiments that if the loop was placed in the terminal ileum, no anemia developed. "A working hypothesis is that materials are formed in the stagnant loop which in some way interfere with the formation, absorption or utilization of hematinic principles." Diarrhea was not present. In rats the use of liver extract and folic acid cause a satisfactory response with the hemoglobin and red cell count rising nearly to normal and resulting in cure. They noted that with the hemoglobin down the nutrition and resistance to infection were impaired and unless corrected the animal died.

Toon and Wangensteen[11] repeated the experiments of Watson, Cameron and Witts, but also gave the rats aureomycin. In these cases the anemia was not seen. They believed that stasis and unusual bacterial activity were significant factors in the production of the macrocytic anemia.

Estes and Holm[4] report cases of side-tracked dilated loops with obstruction resulting in tremendous dilatations and producing symptoms of pain and diarrhea due to enterocolitis with ulceration but without the blood findings noted by others.[10–12]

Eckel and Holman[3] reported a case of side-to-side anastomosis following resection of a lesion of the ascending colon twenty-two years before. This patient showed severe anemia (40 per cent hemoglobin, two plus million red blood cells), abdominal pain, diarrhea and loss of strength. X-ray showed a partial obstruction of the terminal ileum. At operation the only pathologic disorder was a blind loop of ileum 10 inches long. This was resected, with complete cure. Experimentally they found that loops were less likely to cause trouble if the anastomosis was in an isoperistaltic way.

Recently, Heifetz and Senturia[6] presented eight cases of a blind loop obstruction with one case presenting the aforementioned picture. In this patient 5 feet of ileum had been resected and an ileoileal side-to-side anastomosis done eight years before. The patient was admitted for diarrhea, cramping abdominal pain and severe anemia and weakness. He had been hospitalized off and on for eight years for similar complaints. A dilated sac was noted at the end of the proximal loop. The blood count showed 1,200,000 red blood cells and a hemoglobin of 39 per cent. The blood marrow smears showed macrocytic anemia. Due to his age and general condition, operation was not performed. He was given transfusions and built up generally and then discharged. They stated that no explanation of the blood picture in this case and the one by Eckel and Holman[3] could be given. Other cases in their series with varying sized pouches showed symptoms due only to local pressure and inflammation.

In case reports available to me, unlike the experimental studies, the ileum or colon was the offender. The symptoms, as in the experimental group, were due to either local pressure and inflammation or to failure of absorption of necessary hematinic principles as cited previously. These last cases resembled those seen with massive resection of the bowel. All cases showed varying degrees of pain and diarrhea.

My patient, the one cited by Heifetz and Senturia, and the one cited by Eckel and Holman show a combination of factors which set then apart from either the inflammatory obstruction type and also to a lesser degree from the failure of absorption type. In all three there was a chronic picture of intermittent diarrhea, macrocytic anemia, progressive weakness, and so forth, which responded only temporarily to the usual antianemic and antidiarrhea treatment and which was progressive. Obstruction, perforation and/or gross inflammation were not present. The loop was small and the systemic reaction entirely out of proportion to the pathologic condition found.

In these cases there are three factors present: (1) resection of approximately 5 feet of bowel; (2) the presence of a small dilated pouch; and (3) a chronic diarrhea. Any one or two of these factors will not produce the clinical picture of non-tropical sprue. Resection of 5 feet of bowel is quite common and will produce very little if any symptoms providing some other condition is not superimposed, such as recurrence in ileitis or carcinoma, obstruction or inflammation. The same reasoning is applicable to the presence of a dilated loop.[1] Similarly a chronic intermittent diarrhea does not of necessity result in the clinical picture of non-tropical sprue.[4]

My hypothesis is that in a patient who has had a segment of bowel removed thereby reducing the area for absorption of necessary hematinic principles the production of a severe chronic diarrhea will further decrease absorption, and if continued over a sufficient length of time, will result in the blood and clinical picture of non-tropical sprue. If this is correct, removal of this small area should result in cure.

The dilated pouch which by itself is innocuous as shown by Pearse[8] is the chief offender or "trigger" area in this mechanism. Its position, the constant recurring distention with the production of hyperperistalsis in the loop and the reflex stimulation of the rest of the bowel, produces the clinical picture of recurring pain and borborygmi, with progression until the "trigger" area is removed. The condition is not due to a severe enterocolitis with ulceration.[10] The ability to help these patients by restoring the blood picture to normal and by halting the diarrhea demonstrates that the condition is borderline. If one corrects the loss of blood-forming principles, the condition is improved. This improvement is only temporary and always recurs unless the cause is removed.[6]

The size of the loop in the three cases is too small to conform to the hypothesis[11,12] that materials are formed in sufficient amount in this area to interfere with the "formation, absorption, utilization of hematinic principles." The use of antibiotics such as sulfa drugs and aureomycin caused no improvement as would be expected if this were the cause.[11] Diarrhea was also present, a condition which did not usually occur in the experimental animals.[8–12]

The mechanism of the formation of the "trigger" area and the later causation of clinical signs and symptoms may be explained as follows. When the anastomosis is made, a small pouch or dilatation is left beside the opening. The neck of this pocket is of the same caliber as the bowel at this time (collapsed). Intestinal contents move in and out without difficulty and with no abnormal signs or symptoms. As the pocket dilates, the stoma, whether due to local reaction or some other cause such as adhesions, remains the same size. When the proportion between the size of the loop and the os reaches a certain unknown ratio, emptying becomes more difficult and is manifested by cramps, mild at first, and increasingly severe as the disproportion increases. It is also possible that the very size of the distended loop increases this difficulty by mechanically pulling or twisting the opening in contracting. This process, once initiated, will continue intermittently until the cause of the cramps is removed. This could progress to obstruction and perforation if the opening is small enough. On the other hand, if the neck dilates with the rest of the pouch, there will be no clinical signs as the area empties easily. In these cases the loop may reach enormous size unnoted and will cause symptoms only by pressure or perforation. A glance at Figure 1 will show the disproportion between the loop and the connection with the bowel. This is also borne out by the gross pathologic report.

Just when symptoms appear and just why they occur in only the unusual case cannot be answered. The use of antiperistaltic anasto-

moses may contribute to the formation as suggested by experiments of Eckel and Holman[3] and as seen in my case and that of Heifetz and Senturia.[6] No mention of the type of union was made in the third case.[3]

The possibility of a dilated loop should always be kept in mind in patients who have had bowel resection and restoration of continuity by side-to-side anastomosis. If the patient has persistent pain and diarrhea, and/or anemia and if along with the pain there is a local swelling or mass and the sequence noted in my patient, this will be clinically evident. The exact diagnosis, however, will be made by the use of a barium enema. A gastrointestinal series may show the condition but a small loop may be missed, as occurred in my case. Even in cases of suspected recurring ileitis or malignancy such signs and symptoms may be due to this loop rather than to recurrence.[1] It is my opinion that there are many patients who are chronic invalids being treated for chronic anemia and malnutrition who can be readily cured by removal of the "trigger" area.

Prevention of this condition can be done by using end-to-end or end-to-side anastomoses, a trend which is becoming increasingly more popular in recent years. If side-to-side union is desired, a technic similar to that advocated by Poth[9] will achieve the same result. This has been used by me repeatedly with complete satisfaction.

The only treatment of the loop is resection. At times resection of the entire anastomotic area may be indicated[6] but clinically, removal of the "trigger" area has always resulted in cure.

SUMMARY

1. A brief résumé of the literature, experimental and clinical, on the formation of a blind loop following side-to-side anastomosis has been presented.

2. Examples of the inflammatory and/or obstructive type, and of the stasis type with failure of absorption of hematinic principles have been presented.

3. A mechanism has been described following resection with side-to-side anastomosis in which a small blind loop acts as a "trigger" area, resulting in a chronic recurring progressive diarrhea and anemia simulating nontropical sprue. This has not previously been described.

4. A case has been described in detail in which this mechanism was present, and two others reported from literature. Removal of the loop resulted in complete cure in two cases. One case was not treated surgically.

Addendum: Since acceptance of this article the author operated on this same patient for an ovarian cyst in August, 1952. Examination of the anastomotic area showed a normal wide stoma with dilatation of the proximal 6 inches of ileum. This finding has been noted by the author following resections for regional ileitis and is explained by the ileum acting as a reservoir. The patient has been well to date and is at present having two normal bowel movements a day. Her weight remains at 113 pounds, but was 120 pounds in the winter prior to the onset of symptoms caused by the ovarian cyst.

REFERENCES

1. Black, B. M. and McEachern, C. G. Redundant blind segments of intestine following side to side anastomosis with division of bowel. *Surg., Gynec. & Obst.*, 86: 177–182, 1948.
2. Cameron, D. G., Watson, D. P. and Witts, L. J. The experimental production of macrocytic anemia by operation on the intestinal tract. *Blood*, 4: 803–815, 1949.
3. Eckel, J. H., and Holman, C. Comments on ileocolostomy and intestinal exclusion. *Surgery*, 15: 307–311, 1944.
4. Estes, W. L. Jr. and Holm, C. E. The fate of obstructed loop in intestinal obstruction following an anastomosis around the obstruction without resection. *Ann. Surg.* 96: 924–929, 1932.
5. Ginzburg, L., Colp, R. and Sussman, M. L. Ileocolostomy with exclusion. *Ann. Surg.*, 110: 648–655, 1939.
6. Heifetz, C. J. and Senturia, H. R. Blind intestinal pouches resulting from lateral anastomosis. *Surgery*, 27: 673–687, 1950.
7. Martin, J. D., Jr., Robertson, R. L. and Dennis, E. W. Anemia following resection of intestine. *Surgery*, 24: 819–827, 1948.
8. Pearse, H. E., Jr. Experimental chronic intestinal obstruction from blind loops. *Surg., Gynec. & Obst.*, 59: 726–737, 1934.
9. Poth, E. J. A technique for suturing bowel. *Surg., Gynec. & Obst.*, 656, 1950.
10. Richardson, W. Pernicious anemia due to enteroenterostomy. *New England J. M.*, 218: 374–376, 1938.
11. Toon, W. and Wangensteen, O. H. Anemia associated with blind intestinal segments and its prevention with aureomycin. *Proc. Soc. Exper. Biol. & Med.*, 75: 762–765, 1950.
12. Watson, G. M., Cameron, D. G. and Witts, L. J. Experimental macrocytic anemia in the rat. *Lancet* 255: 404–408, 1948.
13. Weir, J. F., and Comfort, M. W. Folic acid therapy in nontropical sprue; results of treatment in seven cases. *Collect. Papers Mayo Clin. & Mayo Found.*, 758–763, 1947.

TRANSDUODENAL APPROACH IN SURGERY OF THE COMMON BILE DUCT

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SURGICAL removal of a gallbladder containing stones frequently necessitates an active consideration of the common duct. Opening of the duct in its free portion just below the cystic duct level is therefore followed by any one of several maneuvers in an attempt to remove duct calculi and dilate the sphincter of Oddi. Instrumentation of the duct is not without its hazards and particularly so when the duct is obstructed in its lower portion. There is no way of being certain that the metal dilator is not pushing the papilla of Vater against the outer wall of the duodenum. It is even possible to slip because of a stone embedded in a recess or ulceration of the duct. Bacillus welchii invasion of the adjacent soft tissue with its lethal consequences has been reported following forceful instrumentation of the duct.[1] The apparent incidence of stones left behind in all patients operated upon for choledocholithiasis varies from 16 to 25 per cent.[2] Cholangiography done at the time of surgery is a very helpful measure, but it does not rule out entirely the possibility of leaving a stone in the duct. For this reason subsequent studies before removal of the tube are necessary and should always be done before any tube is removed.

In 1898 Charles McBurney presented before the New York Surgical Society a method he had used successfully in three cases for the removal of stones embedded in the pancreatic portion of the duct.[3] A planned retroduodenal approach was forsaken in his first case and the second portion of the duodenum opened. The sphincter was easily identified, incised and the stone removed. Acceptance of this method has been slow, but due credit for its rebirth must go to Richard Cattell. His innovation of the long T-tube to maintain patency of the incised sphincter constitutes a definite advance. Fear of duodenal fistula goes hand in hand with the myth of ascending cholangitis. The opening of the second portion of the duodenum after having mobilized the hepatic flexure of the colon allows for clear visualization of a constant anatomic structure, the ampulla of Vater. Incision and dilatation of this structure and the sphincter of Oddi is most important in the careful removal of large or embedded ductal stones. Leakage about the long T-tube at its point of exit from the common duct may occur and even duodenal contents may be obtained by suction. Such leakage is ephemeral in duration and without serious sequelae of any kind.

It was only in logical sequence that the transduodenal approach should be used in repair of the injured common duct. Most authorities are in agreement that any method of repair using the pancreatic portion of the duct is far superior. The dissolution of the supraduodenal portion of the duct due to necrotic action of free bile as advanced by Dragstedt[4] is a most reasonable explanation for the absence of this portion of the duct encountered at the time of contemplated duct repair. Case III involves the repair of a common bile duct using this method and the long T-tube. Perhaps the method more recently described by Dragstedt[4] of using a catheter brought out through an omental covered duodenal fistula is in some respects better because it allows for a more accurate and complete anastomosis of the duct. That it is possible to unite a small hepatic nubbin of duct with a fully mobilized pancreatic portion of duct is in itself a measure which should prove useful in the greater majority of common duct repairs. The transduodenal approach simplifies a most difficult surgical problem and makes possible the use of the very important and often forsaken pancreatic portion of the duct.

CASE REPORTS

CASE I. Mrs. V. McC., age twenty-nine, entered the hospital on December 20, 1949, and was discharged on January 17, 1950. Her chief complaint was that of upper abdominal pain very severe in nature. During the past three years she had experienced five attacks of right upper quadrant abdominal pain, nausea and vomiting. The most recent attack began about

ten days prior to admission and was ushered in with severe upper abdominal pain radiating to the right shoulder. As the pain subsided, nausea and vomiting became increasingly troublesome. The patient remained at home but was able to eat hardly anything. Jaundice did not develop until about two days before admission. However, her urine has been dark in color for approximately ten days, stools were light in color but not clay colored. The gallbladder visualization study performed on December 12, 1949, revealed a gallbladder that did not visualize. Cholecystectomy and choledochotomy were done on December 23, 1949. The gallbladder was enlarged, the wall thickened and edematous. Many stones the size of marbles were found within the lumen of the gallbladder. The dilated common duct was opened and a series of Bâkes dilators were used. The edematous nature of the duct wall made probing a bit difficult and it was not possible to be certain that the probe passed through the sphincter into the duodenum. A T-tube was inserted and the common duct closed about it. The patient's postoperative period was characterized by copious amounts of biliary drainage. This continued and became particularly disconcerting when clamping the tube caused, within a very short period, abdominal discomfort to be followed by a spurting of bile from the tube as soon as the clamp was removed. A cholangiogram done on December 28, 1949, showed a radiolucent defect at the lower portion of the common duct. (Fig. 1.) When medical measures (Best's "magnesium sulfate method" and others) failed to release the stone, surgical intervention was considered necessary because of the great loss of bile. On December 31, 1949, eight days following cholecystectomy, the abdomen was reopened through the previous incision. The edema about the duct had not subsided, in fact there seemed to be even more tissue swelling; and except for the opening in the common duct from which the tube was removed, it was most difficult to identify the bile duct. In view of the existing situation it was decided to open the second portion of the duodenum and deal with the lower portion of the common duct more directly. The hepatic flexure of the colon was mobilized and the second portion of the duodenum opened, using a longitudinal incision about 1 inch in length. A stone about 1 cm. engaged in the ampulla of Vater was quickly released by incising the upper margin of the sphincter. A

FIG. 1.

malleable probe with a piece of heavy silk threaded through the eye was inserted from below in an upward direction and used to bring the long arm of a Cattell tube down this same distal portion of the duct. The opening in the duodenum was closed transversely using fine chromic catgut on the mucosal layer and interrupted silk on the seromuscular layer. The short end of the Cattell tube was inserted into the hepatic portion of the common duct.

The patient's postoperative convalescence at first was stormy but then leveled off, and she was able to leave the hospital on her seventeenth postoperative day. The T-tube remained in place for three months at which time it was removed without difficulty.

CASE II. Mrs. D. B., age thirty-nine, entered the hospital on March 18, 1950, and was discharged April 6, 1950. She had upper abdominal pain, nausea and vomiting which had been intermittent in type for a period of three days. Jaundice barely noticeable at first became obvious at the time the patient entered the hospital. It was possible to palpate a mass in the right upper quadrant which was tender and considered to be hydrops of the gallbladder. Surgery was performed the following day, March 19, 1950, at which time a large, thick-walled gallbladder containing many facetted stones was removed. The cystic duct, dilated to approximately 3 cm. in diameter, was opened without difficulty. Several stones were removed, but it was not possible to dislodge the obstructing stone or stones in the lower portion of the duct. The second portion of the duodenum was opened and the sphincter incised. A probe was inserted from below upward and with some

difficulty the stone was dislodged upward and removed through the opening in the duct. A long tube (Cattell type) was used and the openings in the duodenum and duct closed in the usual manner. The patient's convalescence was stormy for several days requiring large doses of antibiotic medication to control the febrile reaction which appeared to be due to an activation of the existing cholangitis and hepatitis. She was able to leave the hospital on the nineteenth postoperative day. A cholangiogram done a week before discharge showed no evidence of any radiolucent residual biliary tract calculus. The T-tube was removed without difficulty several weeks later.

CASE III. Mrs. B. B., age fifty-five, entered the hospital on July 15, 1951, and was discharged on August 10, 1951. This obese middle-aged housewife had experienced bouts of upper abdominal discomfort for several years. X-ray visualization of the gallbladder revealed stones. Cholecystectomy was done on July 17, 1951, at which time a chronic type gallbladder was removed. The common duct according to reports was not visualized, but palpation through the foramen of Winslow failed to reveal any palpable stones in the duct. On the second postoperative day jaundice became apparent and increased in severity until an icterus index of 58.5 was reported on the eighth postoperative day.

A second operative procedure was done on July 28, 1951, through the previous subcostal (Kocher) incision and required lengthening of the incision at each end. It was possible to find the hepatic portion of the duct, but the distal pancreatic portion could not be found. The second portion of the duodenum was opened and the ampulla of Vater visualized. Sphincterotomy was done and the probe introduced from below upward encountered firm fibrous tissue obstruction. The upper margin of the first portion of the duodenum was mobilized and enough of the duct freed from the surrounding pancreatic tissue to accomplish an anastomosis of the duct. A long T-tube (Cattell type) was used because of the sphincterotomy. (Fig. 2.)

The patient's convalescence was remarkably uneventful and she was able to leave the hospital on the twelfth postoperative day. She was advised of the necessity of having the tube remain in place for a year. Her physician reported that while holding her infant grandson in her arms, the child's leg became entangled in the exposed end of the tube so that the tube was pulled away. This occurred about four months after surgery; the tube was not in place for as long a time as was desired in order to minimize the tendency to a subsequent development of stricture formation at the site of anastomosis.

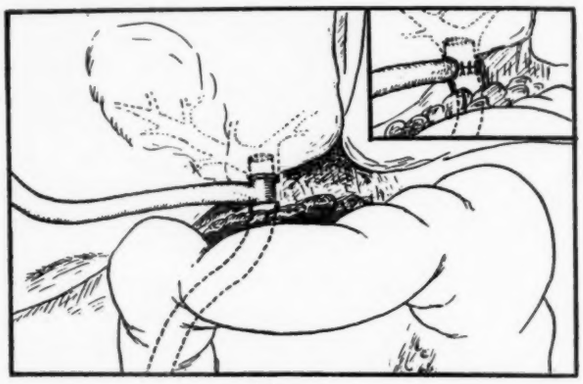

FIG. 2.

CONCLUSIONS

Opening of the second portion of the duodenum so as to allow a more clear visualization of the ampulla of Vater is advised in those cases of common duct surgery in which the degree of obstruction encountered at the lower portion of the duct cannot be relieved by careful use of dilators. If choledochotomy is done at the time of gallbladder surgery, attempted probing should be followed by cholangiographic studies. As a result of the more frequent exposure of the lower portion of the common duct a method for restoration of duct continuity has evolved that has promise of being very useful.

REFERENCES

1. ADAMS, R. Gas bacillus infection following biliary surgery. *S. Clin. North America*, 24: 551, 1944.
2. PRIBRAM, B. O. C. The method for dissolution of common duct stones remaining after operation. *Surgery*, 22: 806, 1947.
3. MCBURNEY, C. Removal of biliary calculi from the common duct by the duodenal route. *Ann. Surg.*, 28: 481, 1898.
4. DRAGSTEDT, L. R. Transduodenal reconstruction of the bile ducts. *Surg., Gynec. & Obst.*, 94: 53, 1952.

FEMORAL HERNIA*

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HEREIN is presented a study of 285 cases of femoral hernia taken from case records for the years 1944 through 1948 at seven Philadelphia hospitals.* The subject matter is arranged in three parts, statistical data, general clinical aspects and surgical aspects.

TABLE I
GENERAL OBSERVATIONS—285 CASES FEMORAL HERNIA

Sex	
Male	75
Female	210
Race	
White	273
Colored	12
Age	
Youngest	2 mo.
Over 60	95 patients
Oldest	86 yr.
Side Involved	
Right	91
Bilateral	1
Left	192
Undetermined?	1
Recurrent	
10 Cases	

STATISTICAL DATA

Two hundred eighty-five cases of various races and ages were studied. The condition affected women three times as often as men. The older age group was more often involved. The left side was involved much more often than the right and bilateral involvement was of meager occurrence. The figures are expressed in Table I. In a word fundamental statistics, as usually given, have been substantiated once again.

CLINICAL ASPECTS

Femoral hernia is important clinically because (1) contained bowel can strangulate and cause death; (2) when not strangulated the lesion can give discomfort, dragging and other annoying symptoms; (3) femoral hernia may be present without giving symptoms at all. A femoral hernia presents through the narrow firmly ringed femoral canal which, though the hernia be present for years, rarely dilates (for anatomic detail see the article by Anson, Reiman, and Swigart[1]). Because of the inability of this ring to dilate complications such as inflammation, swelling and trapped distention progress when the strangulation process has once begun in a femoral hernia. The contents of the sac and the sac wall itself rapidly suffer from the affects of impaired blood supply. Necrosis, obstruction and its dangerous sequellae are produced. It is obvious that death is awaiting its turn somewhere down the line.

TABLE II
STATUS OF ADMITTED CASES

	No. of Cases	Per cent
Emergency	125	44
Elective*	159	55.8
Strangulated or incarcerated	142	50
Deaths	12†	4.2

* Nearly half of these impelled to operation by recent appearance of symptoms.
† One patient not operated upon.

Femoral hernia is a potentially dangerous lesion. Yet the principle of prophylactic surgery is applied to it all too infrequently. Analysis of figures in this study show that (Table II) 44 per cent of the patients were operated upon as "emergencies." Half of the total number of hernias operated upon had strangulated or incarcerated contents (whether operated as emergencies or not). Of those operated electively, at least half were impelled to operation by flare-up of acute symptoms a week or two prior to admission so that they were actually jolted into having surgery performed. The figures dealing with this aspect to the problem showed little improvement over those of McNealy, Lichtenstein and Todd[2] from

* Chestnut Hill Hospital, Germantown Hospital, Graduate Hospital, Hospital of the University of Pennsylvania, Methodist Hospital, Nazareth Hospital, Temple University Hospital.

Chicago in 1942 or Jarboe's[3,4] from the Mayo Clinic up to 1949. In a medical community committed to prophylactic surgery our only conclusion in finding it not applied here is that the medical profession does not realize how dangerous femoral hernia can be. A second conclusion must be that the condition is not diagnosed as often or as soon as it might be. Why is this? Three reasons come to mind: (1) femoral hernia is often symptomless; (2) women in whom the lesion predominates are so infrequently checked for this hernia and (3) in our hurried practice proper examination of the femoral region is not done.

TABLE III
FINDINGS AT OPERATION

	No. of Cases	Per cent
Gangrene of bowel	20*	7
"Dusky" bowel	32	11.2
Gangrenous omentum	26	9

* Two presumptive.

To concentrate on the serious problems of incarceration and strangulation (Table III) 7 per cent of the total number of patients arrived at the hospital with gangrenous bowel and 9 per cent more with gangrene which involved omentum alone and not bowel. When in the lesion under discussion one of every six patients comes to surgery with a life-threatening complication which is preventable, there is considerable room for improvement. If we add to the cases above those with "dusky bowel" found on opening the sac (the circulation partially impaired), it means that nearly one of three patients with femoral hernia comes to the hospital with his life in peril.

What other factors contribute to this unhappy state? One is the procrastination of the patient after trouble begins. A second is the failure of doctors to look for femoral hernia when general abdominal symptoms of varying severity are present elsewhere. In one unfortunate case in this series a patient was treated for "intestinal grippe" for nearly a week; gangrenous bowel was found at operation within a femoral hernia and death occurred. A second patient with more indefinite complaints was studied very thoroughly including many laboratory tests in one of our best hospitals, and about a week after she was discharged her unrecognized femoral hernia strangulated. A third unfavorable attitude is the feeling some physicians have that they can distinguish clinically between "incarceration" (the hernial contents simply held in the sac) and "strangulation" (blood supply interfered with and bowel obstructed). The use of these adjectives should be limited to postoperative description. Clinically, femoral hernias in such a questionable state should be regarded as "strangulating" and so handled. A fourth unfavorable factor is the practice of attempting to reduce a strangulating hernia by taxis. If the patient cannot reduce it, the physician cannot and his attempts will only add to the trauma already present. A horrible example of misguided effort along this line was a case in this series in which over a four-day period the physician persisted in efforts at reduction resorting even to the local injection of novocaine in order to "relax" the tissue. The patient was a hopeless risk when a vain attempt was eventually made to save her by operation. If a reduction of the hernia is accomplished by taxis, the physician has no knowledge of what he has reduced. He has no way of knowing whether or not he has pushed gangrenous bowel back into the peritoneal cavity. It is difficult enough to know when the bowel is exposed at operation whether or not it may be safely returned. How impossible is it to know when one reduces such a mass blindly and what a tremendous risk it is.

SURGICAL ASPECTS

The surgical repair of a femoral hernia done electively presents no problems. The technic employed seems a matter of choice and results are good. In strangulating femoral hernias the surgical problem is a momentous one. Occurring as it does so often in the older age group, many patients with strangulated femoral hernias are in a poor state of cardiovascular-renal or liver disease and it is a problem to know what to do with them. Mortality of the entire series of 285 cases was twelve or 4.2 per cent. Of the 50 per cent of cases which were incarcerated or strangulated when they came in, the mortality rate was 8.4 per cent, a marked improvement over McNealy's 1942 figures for a similar group which was 23.1 per cent. In eighteen cases in which gangrenous bowel was present when the hernial sac was opened, thirteen had resection of bowel and primary anastomoses, two had

exteriorization of gangrenous loops and three had small gangrenous areas oversewn. The operative mortality of this whole group of eighteen cases was 55 per cent. This is entirely too high and our efforts should center on trying to reduce it.

Analysis of Death. Following resection one patient died of circulatory collapse and one of pulmonary embolism, these perhaps unavoidable. Another had a suppurative process within the abdomen secondary to resection. Six died of the overwhelming toxins accompanying the bowel necrosis and small bowel block; progress can perhaps be made here. In one patient prehospital delay had been so long that he died before any attempt could be made to operate. Another man had been successfully operated upon for an incarcerated hernia and when almost ready for discharge fell down a stairwell and died. The final case listed was one in which the patient died following the slipping back of the contents of the hernial sac as the operator watched. It was described as necrotic omentum but probably was gangrenous bowel; the patient had had obstructive symptoms and died a toxic death.

Adverse Factors. The following unfortunate occurrences contributed to the demise of half of the patients who succumbed. One patient saved in the emergency by an enterostomy was reoperated upon for closure when not fully recovered and in a definite state of fluid, electrolyte and protein imbalance and died. This imbalance contributed in part to her death. In two cases a slough occurred at the suture line of the anastomoses. This was found at autopsy in one, with leakage of bowel contents. The other patient developed obstruction; the bowel ends were found to be necrotic. Death followed the secondary enterostomy. Misdiagnosis contributed to another death, the patient being in the hospital three days prior to operation while being evaluated for "cholecystitis." Through an upper right rectus incision the actual lesion was finally found and appropriate measures taken. Death unfortunately ensued. In one other case I cannot help but believe an operation lasting three hours contributed to the fatality. She was a poor risk to begin with suffering from diabetes, hyperthyroidism and advanced cardiovascular-renal disease, but three hours of manipulation did not help.

These "adverse factors" bring forth rather obvious positive comments. All patients should be checked for femoral hernia even when symptoms are rather general; patients should be brought as nearly as possible into balance in the shortest allotted time, and enough bowel and mesentery must be resected to assure good blood supply; it is no more shocking to resect enough than to resect an insufficient amount. Primary anastomosis is a finished job; I prefer it to enterostomy with its morbidity and secondary mortality risk.

As to time consumed at operation it was striking to me that in so many of the desperate cases the operations ran two hours, an hour and fifty minutes, two hours and a half, etc. There is room for improvement here and this would be accomplished if a plan of attack were worked out for these cases with the surgeons or residents who are going to do the operating. This would include (1) a familiarity with the best accepted operative procedures and (2) an exact knowledge of the anatomy of the region, an invaluable thing, which will permit orderly, intelligent variations in operative procedure as the needs arise.

SUMMARY

1. Some aspects of femoral hernia have been presented from a study of 285 cases, and grouped under three headings: statistical data, clinical aspects and surgical aspects.

2. Statistics bear out classical generalizations in regard to sex, side involved, age, race, etc.

3. Clinically the outstanding point is that too many femoral hernias come to operation as emergencies (44 per cent); and in half of the total cases the hernia contents were found incarcerated or strangulated. There were twenty cases with gangrenous bowel.

4. The real surgical problems are those arising in the patients with gangrene and bowel obstruction. The mortality for the series as a whole was 4.2 per cent, whereas for those cases with gangrene in which definitive surgery had to be done the mortality was 55 per cent. Adverse factors contributing to these unfavorable results in half the cases are discussed with a view toward their avoidance in the future.

5. A prepared "plan of attack" is suggested for improving results.

Acknowledgment: Thanks is expressed to those whose cases the author was permitted to review.

REFERENCES

1. Anson, V. J., Reiman, A. F. and Swigart, L. V. The anatomy of hernial regions. *Ann. Surg.*, 81: 1009–1013, 1925.
2. McNealy, R. W., Lichtenstein, M. E. and Todd, M. A. The diagnosis and management of incarcerated and strangulated femoral hernia. *Surg., Gynec. & Obst.*, 74: 1005–1010, 1942.
3. Jarboe, J. P. and Pratt, J. H. Strangulated femoral hernia relationship of contents of hernial sac to clinical manifestations and prognosis. *Am. J. Surg.*, 77: 172–180, 1949.
4. Jarboe, J. P. and Pratt, J. H. Strangulated femoral hernia. Surgical management. *Surg., Gynec. & Obst.*, 84: 184–194, 1947.
5. Nemir, P., Hawthorne, H. R., Cohn, I. and Drabkin, D. L. The cause of death in strangulation obstruction: clinical course, chemical, bacteriologic and spectrophotometric studies. *Ann. Surg.*, 130: 857, 1949.
6. Nemir, P., Hawthorne, H. R., Cohn, I. and Drabkin, D. L. The cause of death in strangulation obstruction: lethal action of the peritoneal fluid. *Ann. Surg.*, 130: 874, 1949.

Primary cancer of the gallbladder is almost invariably associated with gallstones. After many years these stones produce chronic irritation of the adjacent gallbladder wall, leading to malignancy and invasion of the gallbladder bed of the liver. Surgery is usually ineffectual in these cases because the liver is quickly and often extensively involved. The mortality which ensues is much higher than the operative mortality of an uncomplicated cholecystectomy. It is no wonder, therefore, that surgeons now routinely recommend cholecystectomy whenever x-rays show gallstones, even though they have been asymptomatic for many years. (*Richard A. Leonardo, M.D.*)

BONY DEFECTS OF THE HEAD REPAIRED WITH CANCELLOUS BONE

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DEFORMITIES caused by trauma, infection and congenital malformations may be corrected by the use of cancellous bone. This material is readily available in sufficient quantity for most defects; it is readily molded with a certainty of growth and is without the disadvantage of introducing a foreign material into the tissues.

The use of bone about the cranium and head was first reported in 1600 by Fallopius[1] who advised the replacement of uncontaminated bone in cranial injuries, provided the dura was intact. Merrem[2] in 1810 began a series of experiments of grafting bone in animals and Von Walther[3] applied to man the work done by Merrem. Ollier[4] advanced a theory in 1859 that regeneration of bone was dependent upon the periosteum. In 1890 Koenig[5] recommended the use of twin flaps, one containing skin and remainder of pericranium from the site of the defect and the other containing skin pericranium and outer table of bone taken from adjacent areas. The flaps were left attached by a pedicle and transposed. Mueller[6] at the same time corrected a skull defect by transferring a flap of skin pericranium and outer table of bone. Keen[7] in 1905 recommended bone chips from neighboring outer table to repair defects in a score of patients. Macewen[8] in 1912 believed the periosteum was a limiting membrane and new bone was derived from the bone itself. Phemister[9] in 1914 demonstrated that osteogenesis in bone repair occurs from endosteum and to a lesser extent from bone and fibrous contents of Haversian canals. At the same time the crest of the ilium was used by Mauclaire.[10] Secard et al.[11] used cadaver skull for cranioplasties. The bone was treated with xylol, alcohol and ether, then sterilized by heat. No tissue reaction or bony absorption was described. Mowlem[12] advocates the use of cancellous bone in repair of bony defects. MacCollum[13] recommends bone from the iliac crest to relieve nasal deformity without any sequelae distressing to the patient. Mowlem[14] in 1944 reported on seventy-five patients in which cancellous chip bone grafts were used. In the same year Converse et al.[15] reported on the repair of cranial defects repaired by cast chip bone grafts, and later, Converse[16] reports on the early and late treatment of jaw wounds using cancellous bone for restoration. Clarkson et al.[17] state that cancellous bone chips for grafting are simple, safe and certain, producing union much more rapidly and can be used earlier than cortical bone grafts. Macomber[18] uses cancellous bone for correction of contour defects and body losses of facial structures. Blocker and Weiss,[19] in a series of forty-three patients, employed cancellous bone on the mandible and used it in the maxilla of nine patients. These grafts were from the ilium and shaped to fit the defect. Soderberg et al.[20] use cancellous bone as graft material because of its superior osteogenic properties. Macomber[21] uses cancellous iliac bone in bone depressions of forehead, nose and chin.

Lane et al.[22] in a survey of 115 veterans hospitals revealed that forty-nine metal plates had been removed from the skull by April, 1947. They also found conservative measures in cranioplasties were useless because drainage continued until the plates were removed. This observation was made not only in cranioplasties but also in other areas where allopathic materials have been used.

Cancellous bone grafts have been used by the author in a series of patients, varying from initial wounds requiring definitive reconstruction, some that were a failure by other means and delayed repairs, such as skull defects, unreduced maxillary fractures, rhinoplasties, loss of mandibular substance, frontal sinus depressions, orbital ridges, et cetera, with equal success.

Diagnosis is made from the history, physical examination and x-ray studies, after which a plan of reconstruction is evolved and the following considerations given: the morbidity, and

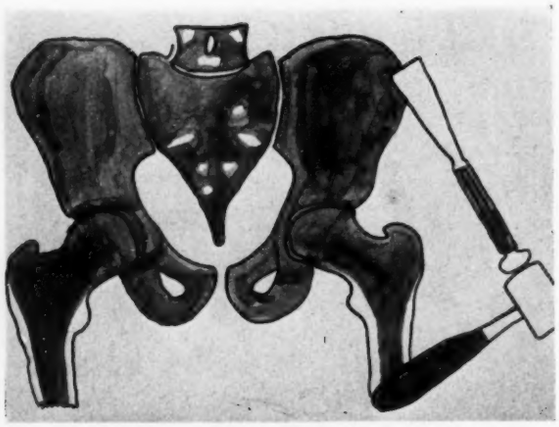


FIG. 1. Drawing to show removal of cancellous bone.

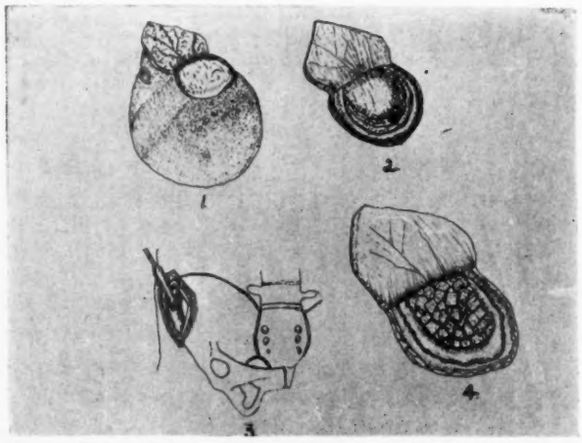


FIG. 2. Bony defects of the head repaired with cancellous bone. (1) defect in skull; (2) defect prepared for reception of autogenous bone chips; (3) donor area of ilium; (4) bone chip in place.

the final physiologic, anatomic and cosmetic results.

The operative procedures are well enough standardized at present to permit their use in areas unthought of prior to World War II. The bone chips may be placed in defects earlier than is possible by other methods, and in jaw reconstruction solidity is almost as early as a non-complicated fracture without loss of substance.

Modeling is easy and smooth contours are the rule. This method of repair not only grafts bone but also transplants into the defect all elements of a callus, which will subsequently be converted into new bone. It is applicable in the treatment of pseudo-arthrosis, obliteration of bony cavities, cranial openings, in rebuilding bones lost partially or completely or to produce a strong arthrodesis.

TECHNIC

The grafts are obtained by exposing the anterior 3 inches of the iliac crest by an incision extending down to the bone. (Fig. 1.) The attachments of the abdominal muscles to the crest and of the gluteal muscles to the outer surface of the ilium are cleared by blunt dissection. The requisite piece of cancellous bone may consist of either part of or the whole wing of the ilium. Removal is effected by means of a broad osteotome; shaping is carried out by sharp-cutting instruments and during this process as much of the cortical bone as possible is eliminated. In other words the transplant is designed to consist chiefly of cancellous tissue and to contain the minimal number of traumatized cells. The recipient area is opened usually through the old scar. (Fig. 2.) The transplant is then cut into chips of approximately 1 sq. cm. and 1 mm. in thickness. The periosteum is elevated to enable the transplant to lie in close contact with the bone; however, cancellous bone grafts need not necessarily be in contact with osseous tissue but can be kept alive and growing when transplanted into soft tissues beneath the skin. They are molded to the desired contour, cover replaced and sutured, with or without drainage, depending on hemostasis.

CRANIOPLASTY

The wound should be completely healed and the skin in sufficiently good condition to recover the opening without traction. When it has been determined that the patient is in suitable condition for operation, the orifice to be bridged is uncovered at the site of the existing scars which should be removed at the same time in order to obtain primary union. Flaps are turned back and the orifice of the skull is well freed by a periosteal elevation; the periosteum of the skull (Fig. 2) is lifted up all around the opening for a space of 2 to 3 cm. in order to permit easy introduction of the graft. The grafts are then carefully cut and shaped to fill the entire opening, extending beyond the edge at least 1 cm. in every direction. The skin is folded back and sutured with interrupted sutures, without drainage. The grafts should be molded so they will assume the exact form of the skull to be repaired. (Fig. 3A and B.)

PSEUDOARTHROSIS OF THE MANDIBLE WITH OR WITHOUT LOSS OF BONY SUBSTANCE

The wound is opened at the site of the scar and the ends of the bone exposed by means of

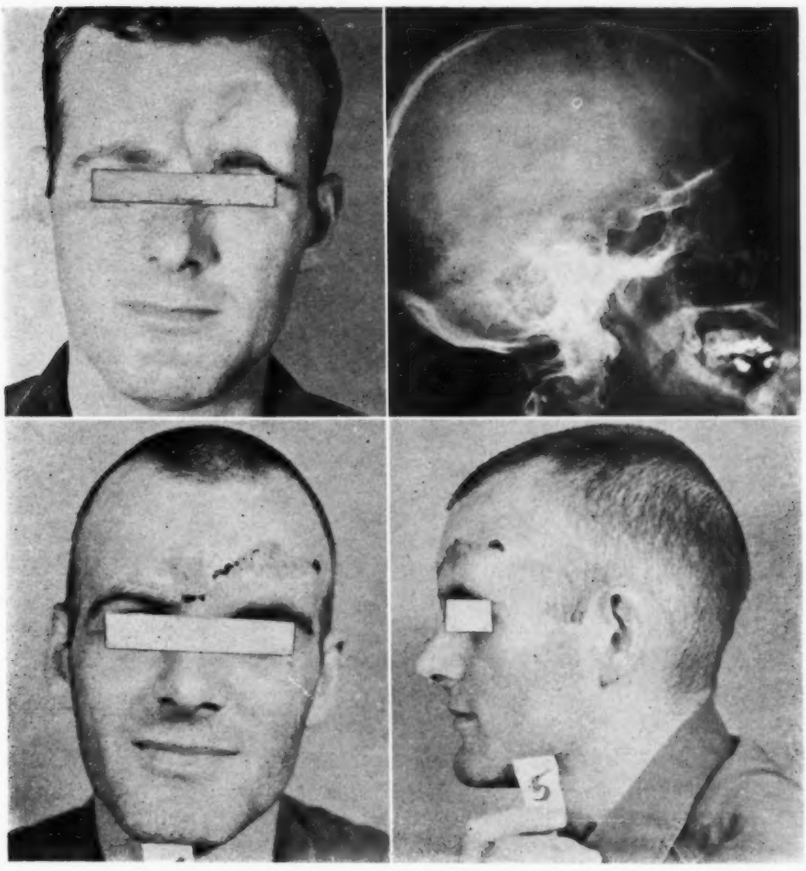


FIG. 3. Loss of supraorbital ridge, frontal sinus, left eye and roof of orbit.

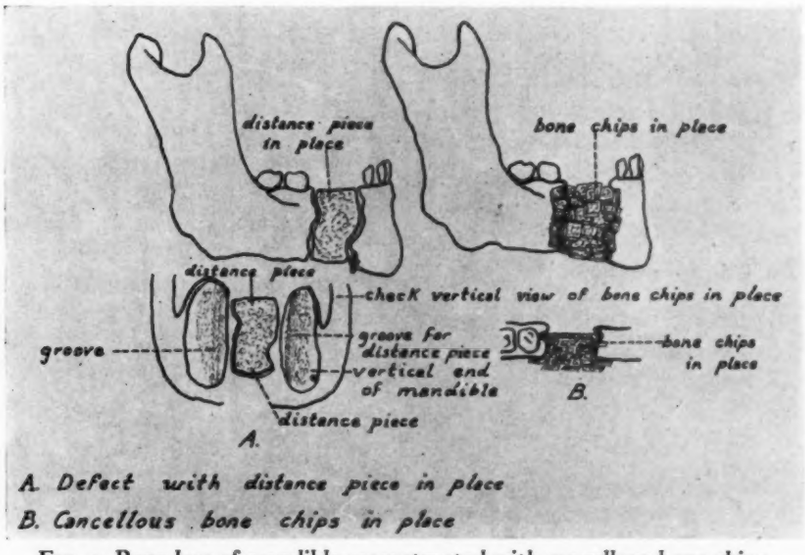

distance piece in place
bone chips in place
distance piece
check vertical view of bone chips in place
groove
groove for distance piece vertical and of mandible
bone chips in place
distance piece
A.
B.
A. Defect with distance piece in place
B. Cancellous bone chips in place

FIG. 4. Bone loss of mandible reconstructed with cancellous bone chips.

5A 5B 5C

FIG. 5. A to C, x-rays and pictures showing graft in position.

periosteal elevator avoiding penetration of the mouth; however, this has happened on occasion without any untoward effect. When the ends are denuded as far as desired, the mandible is reduced the required distance and the grafts placed. (Fig. 4.) The first graft extending from fragment to fragment is called the distance piece and is placed to form the new alveolar ridge. Then the defect is built out with chips of cancellous bone approximately 1 cm. square and 1 mm. in thickness. (Figs. 5A to C.) The skin is sutured without drainage. Hematoma has developed in two grafts without deleterious effect. Fixation of the mandible is necessary in this position; external fixation has been utilized in some; intraoral splints applied in others and a combination of both internal and external fixation being required in some.

BONY CAVITIES

Obliteration of bony cavities should be thoroughly curetted before the grafts are placed. The cancellous bone chips are placed in the depression, one on top of the other, filling the depression with new bone.

LARGE FACIAL DEFECTS

Restoration of missing parts of face, nose, walls of sinuses, malar bone, superciliary ridge and orbital fossae may be restored. The grafts are trimmed and sculptured to take the form of the bone to be replaced. Again good cover is important.

RHINOPLASTY

Bone transplants for elevating the nasal bridge of the nose does not have the tendency to twist, a disadvantage found in cartilage. However, calcium absorption takes place and is replaced with fibrous tissue in sufficient quantity to retain the original cosmetic effect. It may be used either as a carved block which will fuse with its bony base, or as chips molded to proper contour and held in shape by dressing until fusion occurs. The carved implant has the advantage of requiring less care and there is less chance of distortion of the contour during growth. (Fig. 6A and B.)

DEFORMITY OF MAXILLA, MALAR BONE AND ZYGOMA

When the depression deformity is due to fracture, with displacement of the anterior or lateral walls of the maxilla, malar bone or zygoma, repositioning of the bone may be extremely difficult or impossible after ten days. The soft tissue may or may not have been destroyed. If destroyed, replacement is necessary; if not, the depression may be built up. When a superimposed scar is present, the incision may be made through the scar for the purpose of undermining and turning back the skin flaps.

If a scar is absent, an incision may be made to the side and the depression built up to match the opposite side. The closure should be made carefully and a pressure dressing applied.

TO RAISE THE EYE FOLLOWING LOSS OF INFRA-ORBITAL BONE

With loss of the infra-orbital rim of bone or floor of the orbit, the eye tends to be depressed downward and diplopia is common due to interference with detachment of the inferior oblique muscle. In such situations the orbital floor and the infra-orbital rim may be reconstructed by inserting the proper amount of

bone through a small incision in the lower eyelid after dissection of the soft tissues from the bone of the orbit. The diplopia is not always correctable, but improvement or approaching normal vision is the rule.

TO CORRECT THE LOSS OF THE SUPRAORBITAL RIDGE

The frontal bone, including the supra-orbital ridge, may be lost either from trauma or disease. The etiology is of some concern when due to disease because reconstruction is contra-indicated until arrest of the disease process is assured. The frontal bone is replaced as in any craniotomy as shown in Figure 3A and B. The ridge will require some extra build-up to match its fellow of the opposite side. This will usually be accomplished most easily by a shaving of cancellous bone or a block fashioned to shape.

DEPRESSION DEFECT OF SOFT TISSUES

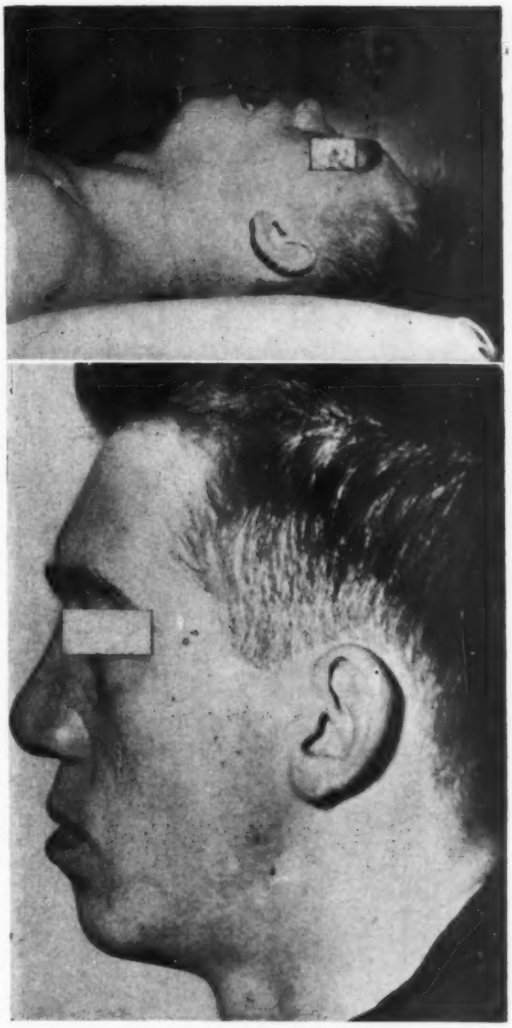
Spreading of the soft tissue following trauma or scar contracture may result in a depression even though bony tissues are only slightly malaligned. A permanent elevation of these depressions is produced by opening and excising the scar and filling the underlying depression with cancellous bone chips. The incision is then closed and a minimal scar results.

CONTURAL DEFORMITIES OF MANDIBLE

A defect in the contour of the mandible may be erased by exposing the affected area and making the necessary filling with cancellous bone chips or cancellous bar. If soft tissues are lost, they must be replaced before the bone graft is implanted. The incision is carried to the mandible over the defect, the periosteum is raised, and if a scar is present in the cover, this is excised and the cover closed in layers. If a scar is absent, a small incision will suffice to underline the periosteum; or if a scar is present, it may be used for insertion of the bone chips and the necessary molding. (Fig. 7A and B.)

MICROGNATHIA

A receding chin in which malocclusion is of only slight or no concern, cancellous bone may be introduced as a block or as chips. An incision about 2 cm. in length is made submandibularly to either side of the midline, and the soft tissues are undermined over the symphysis. The periosteum is raised if possible to permit the positioning of the block or chips on the bone. As the cancellous transplant grows, it becomes fixed more solidly to the mandible. The mandible should be built up to the desired level, molded to shape and the original incision carefully closed and splinted with a pressure dressing for a few days. When a cancellous block is used, splinting for forty-eight hours is sufficient.



6A

6B

FIG. 6. A and B, rhinoplasty.

PATIENTS WITH LOSS OF PREMAXILLA

To hold the upper lip forward in situations where the premaxilla has been lost, it is possible in some instances to bring the upper lip forward by laying a block of cancellous bone in the

FIG. 7. A and B, cancellous bone graft to jaw.

upper lip. The block of cancellous bone will necessarily have to be longer than the defect. The fornix under the lip is opened across the maxilla from side to side; undermining is done carefully so as not to penetrate into the nostril on either side. The bone block is then laid in the lip across the defect. This does not work except in selected patients.

The foregoing method of caring for defects has been used in my series of patients, as follows:

Craniotomies	29
Malar bone, zygomatic and maxillary defects	17
Mandible with loss of 2 cm to 8 cm	34
Frontal bone and supraorbital ridge defects	12
Infraorbital ridge and floor of orbit	7
Rhinoplasties (saddle nose)	8

One hundred seven patients have been operated upon, and in this group the bone was absorbed in one craniotomy. One non-union in a mandible resulted but in each patient the procedure was repeated with complete take. Infection with loss of bone was not observed.

COMMENT

The manner of growth and survival has been the subject of controversy. Ollier[1] experimenting with bone grafts in animals was able to show that periosteum was essential for bone survival. This theory has been elaborated to show that the graft is vascularized and revitalized from the periosteum. However, a different explanation is made by others, that a few bony cells adherent to the periosteum survive and replace the transplant. Macewen[1] believed that the periosteum plays no part and acts as a limiting membrane and that new bone derives from the bone itself. Phemister[1] was able to demonstrate the correctness of both of the above observations. In his studies new bone was derived not only from the periosteum but also from the connective tissue lining of the Haversian canals. Bone cells in a transplant have the power of survival and that is dependent upon the rapidity with which it can acquire nutriment in its new position. This nutrition will as in any other grafted tissue be

derived from the blood serum and tissue fluid and later from the ingrowth of vascular supply. In cancellous transplants nutrition is available at a very early period due to sponginess of the bone. It will be bathed early in serum and tissue fluid and ingrowth of arterioles will find new mechanical barriers. This is borne out by examination of removed specimens which are very vascular if removed at the end of six to eight weeks. However, Mowlem[12] has shown that cancellous bone placed in a relatively avascular fatty area rapidly undergoes a gross degree of absorption, which is in marked contrast to its behavior when transplanted into vascular tissues of the head.

In the behavior of cancellous bone the appearance of the graft changes very little except that irregularities of contour tend to be rounded off, then tend to maintain its contour unchanged. The time element for this change is approximately sixty days. Infection has been conspicuous by its absence; this may be accounted for by the use of antibiotics or the ease and rapidity of vascularization.

The x-ray appearance of the grafts does not seem to be any different whether a bony attachment is present or not. Peripheral cancellous bone appears to develop a cortical structure in approximately sixty days.

The histologic picture seems to parallel the radiographic and clinical picture. The sections of bone from my series of cases, shown here, have been *in situ* for a period of one hundred ninety-three days and twenty-four months, respectively. (Figs. 8 and 9.) They show a relatively normal cortical bone structure surrounded by a dense layer of connective tissue which probably carries on the function of the periosteum as contrasted with cancellous bone at the time of operation. (Fig. 10.)

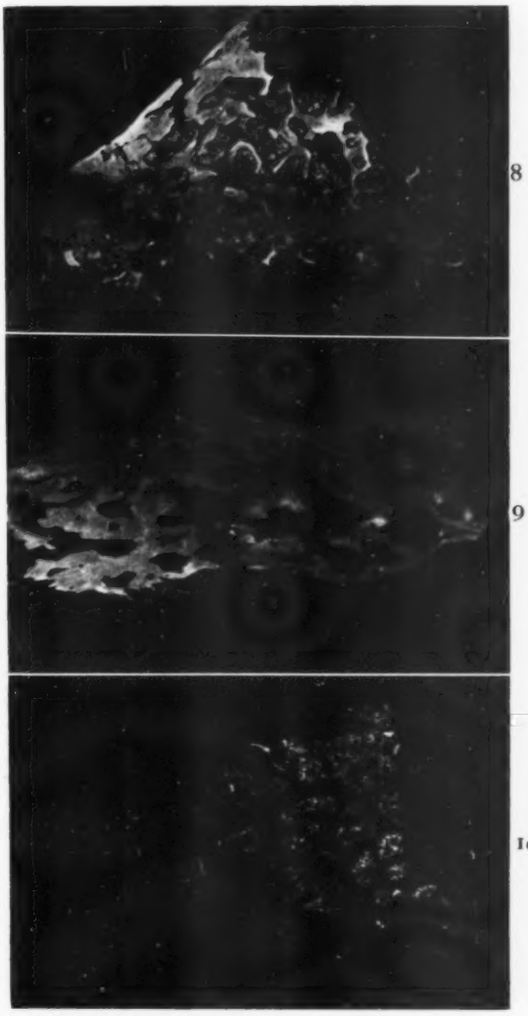


FIG. 8. Microscopic slide 193 days after insertion.

FIG. 9. Microscopic slide twenty-four months after insertion.

FIG. 10. Microscopic slide of cancellous bone at time of operation.

SUMMARY AND CONCLUSIONS

Cancellous bone has been used in a series of 107 patients in an effort to overcome the difficulties found in cartilage and allopathic materials. The technic employed has been described and the following conclusions have been arrived at: (1) Sufficient cancellous bone is usually available. (2) There is a certainty of growth. (3) The ultimate cosmetic, anatomic and physiologic results are excellent. (4) The foreign body reaction of allopathic materials is absent. (5) Cancellous bone acquires a fibrous cover and cortical bone in a period of approximately sixty days radiographically. (6) In rhinoplasty the disadvantage of twisting of cartilage is absent.

REFERENCES

1. FALLOPIUS, G. Opera Omnia Cui Nunedenum Accessit Tomus Secundus. Opera et Studio Johan. Petri Maphali, vol. 1, p. 749; vol. 2, p. 344. Framofurti A. Wecheli, 1600.
2. MERREM, D. C. T. Animadversiries quaedam cherurgical experimentis in animalibus factis illustatae. Goettingen, 1810. Giessae, Tasche and Mueller.
3. VON WALTHER, P. Wiedereinheilung der bei der Trepanation ausgebahrten Knochenscheibe. *J. d. Chir. u. Augenh.*, 2: 571–583, 1821.

4. Ollier, L. De la production artificielle des os au moyen de la transplantation de perioste et des greffes osseuses. *Gaz. med. Paris*, 30: 226, 1859.
5. Koenig, F. Der Knocherne ersatz grosser Schadeldefekten. *Zentralbl. f. Chir.*, 17: 497–501, 1890.
6. Mueller, W. Zur Frage der temporaren Schadelresektion au Stelle der Trepanation. *Zentralbl. f. Chir.*, 17: 65, 1890.
7. Keen, W. W. Filling defects of skull by bone chips from outer table of the neighboring bone. *Ann. Surg.*, 42: 296–298, 1905.
8. Macewen, W. The Growth of Bone. Glasgow, 1912. James Maclehore & Sons.
9. Phemister, D. B. The fate of transplanted bone and regeneration of its various constituents. *Surg., Gynec. & Obst.*, 19: 303–333, 1914.
10. Mauclaire. Autogreffe cranienne empruntee a la tuberalique. *Bull. Soc. chir. de Paris*, 40: 113–115, 1914.
11. Secard, J. A., Dambrin, C. and Roger, H. Item: plastie du crane par plaque osseuse homologue. *Marseille med.*, 55: 111–115, 1918.
12. Mowlem, R. Bone and cartilage transplants. Their use and behavior. *Brit. J. Surg.*, 29: 182–193, 1941.
13. MacCollum, D. W. The elevation of the nasal bridge line. *Surgery*, 12: 97–108, 1942.
14. Mowlem, R. Cancellous chip bone grafts. Report on 75 cases. *Lancet*, 2: 746, 1944.
15. Converse, J. M., Clark, C. D. and Guidi, H. Repair of cranial defects by cast chip bone grafts. *J. Lab. & Clin. Med.*, 29: 546, 1944.
16. Converse, J. M. Early and late treatment of gunshot wounds of the jaw in French battle casualties in North Africa and Italy. *Oral Surg.*, 3: 112–137, 1945.
17. Clarkson, P., Wilson, T. H. H. and Laurie, R. S. Jaw and face casualties. *Ann. Surg.*, 123: 190, 1946.
18. Macomber, D. W. Reconstruction of bony defects of the face, with special reference to cancellous iliac bone. *Surg., Gynec. & Obst.*, 83: 761, 1946.
19. Blocker, T. G. and Weiss, L. R. The use of cancellous bone in the repair of defects about the face. *Ann. Surg.*, 123: 62, 1946.
20. Soderberg, B. M. and Mulvey, J. M. Mandibular reconstruction of jaw deformities. *Plast. & Reconstruct. Surg.*, 2: 191, 1947.
21. Macomber, D. W. Cancellous iliac bone depressions of forehead, nose and chin. *Plast. & Reconstruct. Surg.*, 4: 157, 1949.
22. Lane, S. and Webster, G. E. A report of the early results in tantalum cranioplasty. *J. Neurosurg.*, 4: 526–529, 1947.

Modern Operative Technics

No. 11

TRANSPLANTATION OF URETERS INTO ISOLATED AMPULLA OF THE RECTUM AFTER TOTAL CYSTECTOMY

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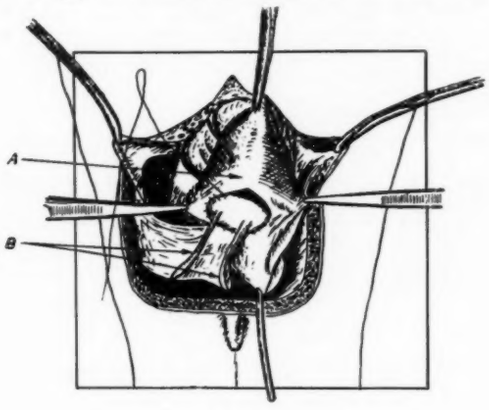
THE proper method of transplantation of the ureters after extirpation of the bladder has always been a problem in surgery.

During the last half-century surgery and urology were enriched with a number of various operative methods which were offered by many authors in connection with this problem. All these operative methods were troublesome because they caused great discomfort resulting from urinary fistula to the skin and very often caused dangerous complications in the kidneys from ascending infection. In this group of operations one should include the recent operations of transplantation of the ureters into a part of the intestinal tract. The clinical observations and the results did not satisfy the surgeons or the patients because of complications in the ureterorenal system. The following is a brief enumeration of the various surgical methods which were employed for transplantation of the ureters into the intestinal tract: In the condition of exstrophy of the bladder the concept of such transplantation into the rectum was offered in the fourth decade of the nineteenth century by Mueller, Enderlen and Trendlenburg. This operation was actually performed by Simon and Roux, and later by Soubotin. In 1892 Maydl used the sigmoid colon for ureteral implantation, and later Makks, Mueller, Enderlen, Gersuny, Borelius and Seiffert improved on this method. Numerous modifications of these original pioneer attempts have been added to the literature since these early trials; it would appear unnecessary to discuss each one in detail. In essence, the principle employed in each method was to transplant the trigone of the bladder or each ureter separately into the sigmoid colon or in some cases into the lower ileum.



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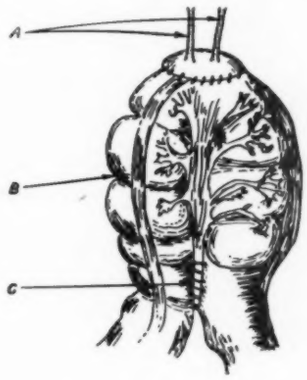

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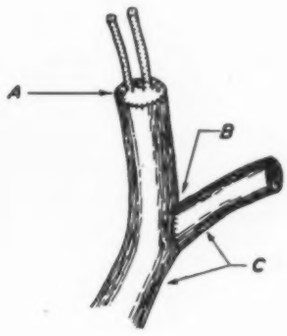

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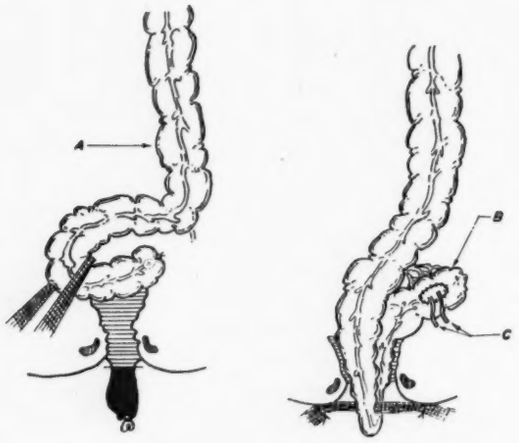
FIG. 1. Maydl operation. A, rectum; B, ureters.

FIG. 2. Borelius operation. A, ureters; B, sigmoid colon; C, anastomosis.

FIG. 3. Mueller operation (scheme). A, ureters; B, anastomosis; C, colon.

Several of the methods presented in the surgical literature are given in the following illustrations: Maydl (Fig. 1), Borelius (Fig. 2), Mueller (Fig. 3), Mauclaire-Kleinschmidt (Fig.

4). Recently Mauclaire advanced an idea similar to my own procedure described herein. Kleinschmidt, as he reported, utilized Mauclaire's scheme and, improving on it, performed a number of such operations. All the aforementioned methods unfortunately do not overcome the main problem of ascending infection from the intestinal tract to the kidneys (pyelitis and pyelonephritis ascendens).



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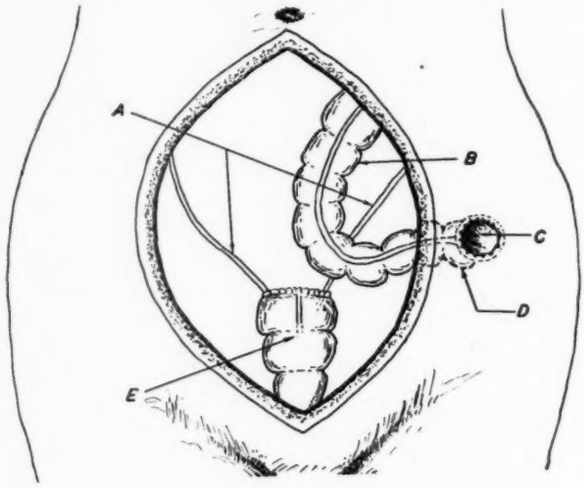

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FIG. 4. Kleinschmidt and Mauclaire operation. A, sigmoid colon; B, sigmoid; C, ureters.

FIG. 5. Kodis operation. A, ureter; B, descending colon; C, preternatural anus; D, sigmoid colon; E, rectal ampulla.

Clinical observations and practice forced us to concede that after successful radical extirpation of the bladder with transplantation of the ureters, regardless of whatever part of intestinal tract served as a reservoir, the patient finally died from infection of the kidneys. The ascending infection from the intestinal tract via the ureter has always been our chief complication.

During the First World War (in 1916) Dr. Kodis, chief surgeon of the Minsk Province Hospital, offered a new method of transplantation of the ureters into the rectum. He used this method in an operation for the total extirpation of a cancerous bladder and prostate in a patient who one year postoperatively was doing well. Clinical and laboratory examination confirmed the condition of the patient. (Fig. 5.)

The original idea of Dr. Kodis to create an absolutely isolated artificial bladder from the ampulla of the rectum inspired me to utilize his idea for the improvement of his method. I wanted to make the patient free from a skin colostomy. A colostomy, no matter how well it functions, is always unpleasant for the patient; it produces many discomforts and makes the patient a semi-invalid. The idea was to utilize the sphincter ani not only for the artificial bladder, as was offered by Dr. Kodis, but also for the resected upper part of the sigmoid colon which was implanted into the rectum. By this method the sphincter ani functions in a double capacity: (1) It serves for normal defecation. (2) It substitutes as a sphincter of the urethra for the artificial bladder.

TECHNIC

Prior to a radical operation for extirpation of the bladder for carcinoma or when there is a cancerous prostate in the male, and for cancerous urethra or bladder in the female, I offer the following method. The operation is carried out in two stages.

First Stage. The abdomen is opened by a middle incision from umbilicus to pubis. The sigmoid colon is mobilized by preliminary freeing of its mesocolon and ligation of blood vessels from below upward as far as possible within the limits of anatomic possibility. (Figs. 6 to 9.)

During the mobilization it is necessary to ligate arterial vessels with care. One must not go above the lower sigmoid artery which lies 2 fingerbreadths above the promontory of the sacrum and which is a branch of the hemorrhoidal superior artery or so-called "Sudeck's point." Ligation above this site may cause necrosis of the lower part of the sigmoid colon. (Fig. 10.) Following this the sigmoid colon is

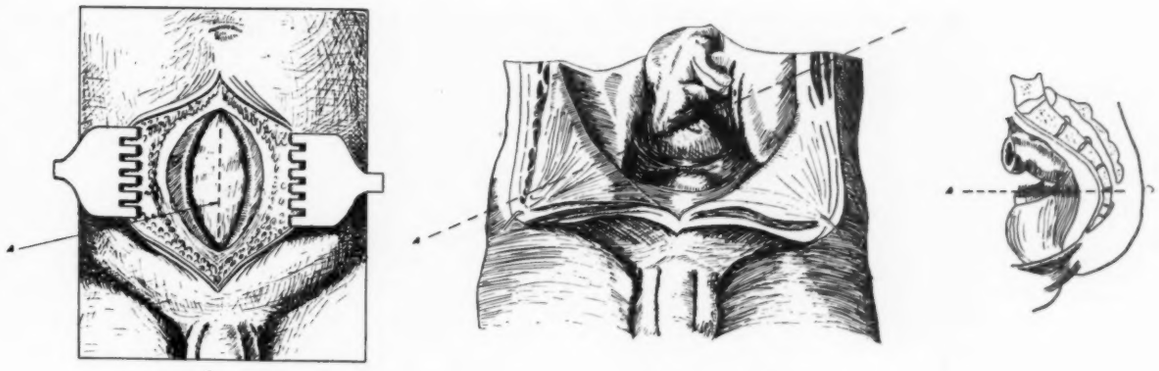

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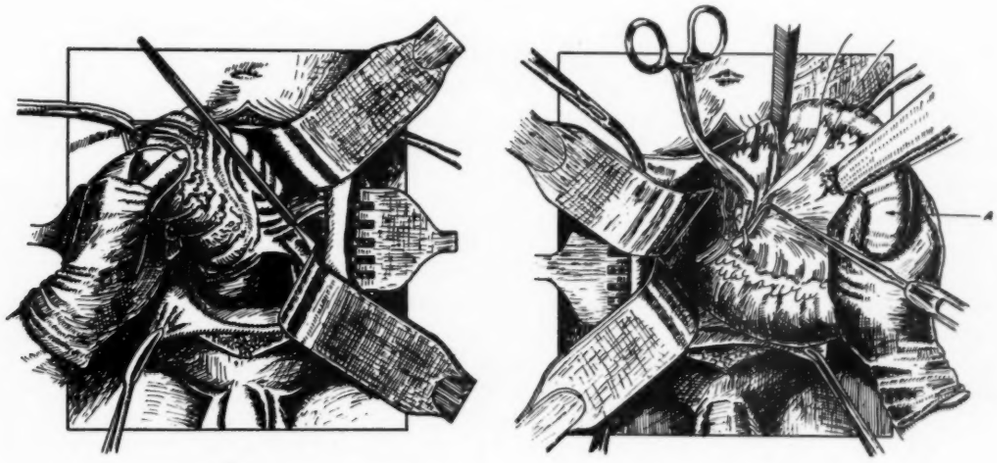
FIG. 6. Levitsky operation.* A, first incision.

FIG. 7. A, line of incision.



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FIGS. 8 and 9. A, sigmoid colon.

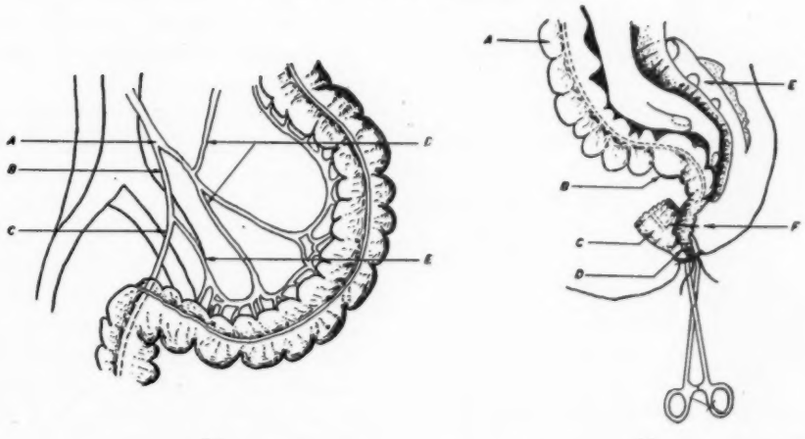

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FIG. 10. Scheme of artery sigmoid. A, inferior mesenteric artery; B, superior hemorrhoidal artery; C, point of Sudeck; D, sigmoid artery; E, lower sigmoid artery.

FIG. 11. A, descending colon; B, sigmoid colon; C, rectal ampulla; D, sphincter ani; E, os sacrum; F, line of incision.

* Figures 6 to 15, except Figure 10, are illustrations of the Levitsky operation.

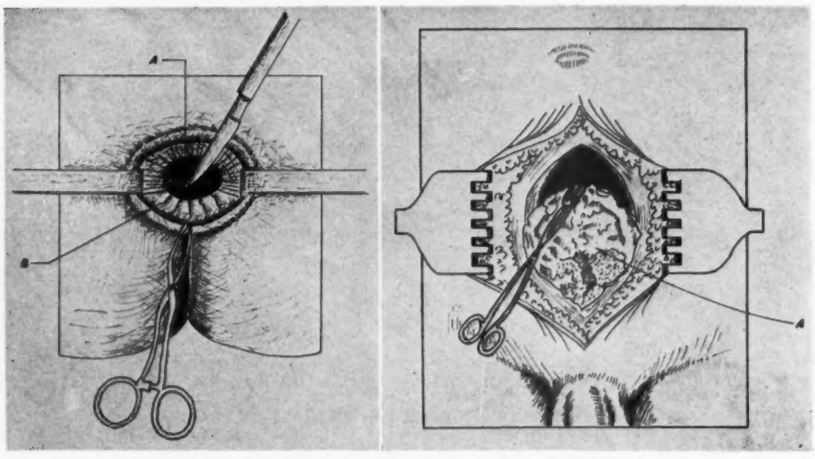

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FIG. 12. A, line of rectal incision; B, anus.

FIG. 13. A, urinary vesical tumor.

sectioned at its junction with the ampulla of the rectum. The opening into the ampulla of the rectum is sutured completely. The free

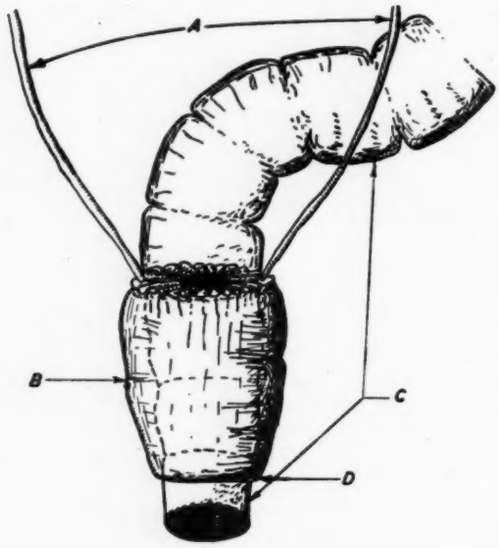

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FIG. 14. A, ureters; B, rectal ampulla; C, sigmoid colon; D, sphincter ani.

FIG. 15. E, rectum; F, sigmoid colon; G, sphincter ani.

end of the sigmoid colon at the site of section is sutured with heavy silk. After this, manual blunt dissection of the ampulla of rectum is performed from the anterior sacrum down to the coccyx as far as the level of the internal sphincter ani. The abdominal incision and abdominal contents are now aseptically draped.

The next step in the operation is performed on the rectum from the perineal aspect with the patient positioned appropriately. (Figs. 11 and 12.) The anus is held open with retractors, and on the posterior aspect of the rectal wall a transverse incision 4 to 5 cm. long is made above the sphincter through which the previously mobilized portion of the sigmoid colon is drawn. After removal of the temporary sutures from the sigmoid colon the latter is drawn 3 to 4 cm. beyond the anal orifice. It should be fixed to the mucous membrane of the anal opening with catgut sutures not exceeding four in the entire circumference. This precaution of forming a redundant or prolapsed orifice is necessary because during the period of healing and scar formation the sigmoid colon which is external to the anus will retract. The first stage of the operation is now completed by suturing the abdominal wall in the usual fashion.

Second Stage. This step is performed not earlier than fourteen days postoperatively depending upon the patient's condition. During this period the isolated ampulla of rectum is disinfected by irrigation of the rectum twice a day employing various antiseptic solutions. Antibiotics are given by mouth. Abdominal entry is made through the scar of the first incision; the bladder and prostate or the female urethra are radically removed. (Fig. 13.) The ureters are implanted into the isolated

ampulla of rectum employing the preferable mucosa-to-mucosa technic. The operation is completed by closure of the abdominal cavity. (Figs. 14 and 15.)

The first two operations according to the foregoing method were performed by me in November, 1916. The two operations were successful and without any complications.

CASE REPORTS

CASE 1. A. J., a fifty-two year old white man, was admitted to the Russian Red Cross Perm Hospital, Minsk, Russia, on November 2 and discharged December 25, 1916. Hematuria, urinary retention and suprapubic pain had developed two years previously. In the last three months he had lost several pounds.

Physical examination revealed anemia and hemoglobin 64 per cent. Urine contained blood and many pus cells. Rectal and bimanual examinations revealed a hard nodular mass of the prostate and bladder which extended 3 fingers above the os pubis.

Operation carried out on November 6th under general anesthesia confirmed findings of tumor which involved the bladder and prostate. The first stage of the operation was performed.

The postoperative period was stormy with high temperature but without severe peritoneal symptoms. On the tenth day temperature and defecation were normal; urination was through an inlying catheter.

A second stage operation was carried out on November 22nd under spinal anesthesia. Radical extirpation of the bladder, prostate and of lymphatic glands was performed, followed with transplantation of the ureters into the isolated ampulla recti. The abdominal wound was closed.

The postoperative course was smooth and uneventful. On the same day urine began to pass spontaneously through the anus. On November 26th function of the newly formed bladder occurred simultaneously with defecation. On December 2nd the patient began to distinguish between desire for urination and desire for defecation. The sphincter ani functioned according to his desire and need whether it was urination or defecation. He felt entirely well. He was under my personal observation for eleven months. *Pathologic findings:* Microscopically, this was adenocarcinoma of prostate.

CASE 11. N. S., a fifty year old white woman, was admitted to the Russian Red Cross Perm Hospital on November 9, 1916, and discharged on January 15, 1917. Symptoms were those of hematuria and purulent vaginal discharge.

Physical examination revealed anemia and hemoglobin 68 per cent. Urine contained blood and many white blood cells. Vaginal bimanual examination revealed a hard nodular mass of the uterus and bladder which extended 6 fingerbreadths above the os pubis. Cystoscopy revealed tumor of the bladder which involved the posterior and upper walls of the urinary bladder.

Operation carried out on November 15th under general anesthesia confirmed findings of the tumor which involved the bladder. The first stage of the operation was performed.

The postoperative course was without high temperature and without severe peritoneal symptoms. On the twelfth day defecation and urination were normal.

The second stage operation was carried out on November 30th under spinal anesthesia. Radical extirpation of the uterus and of the urinary bladder was performed together with transplantation of the ureters into the previously isolated ampulla recti. The abdominal wound was closed.

The postoperative course was smooth and uneventful. On the first day after operation urine began to drain spontaneously through the anus. On the fifteenth day the patient began to distinguish between desire for urination and desire for defecation. She felt entirely well and left the hospital. She was under my personal observation for twelve months. *Pathologic findings:* Microscopically, this was adenocarcinoma of uterus.

Additional Cases

Subsequent operations using the same method were performed in my private hospital in Moscow in 1918–1919. At the same time this operation, termed "Kodis-Levitsky," was performed in the University Hospital in Moscow by Prof. Aleksinsky. At the University clinic the operation was performed in nineteen cases, with deaths in four. I performed the last two operations in 1922 in Pancevo-Belgrad, Yugoslavia, in the hospital of the Russian Red Cross. A short résumé of each case follows:

P. S., a fifty-two year old white man, was admitted to the Central Hospital of the Russian Red Cross in Pancevo-Belgrad on February 22 and discharged on April 25, 1922. He gave a six-month history of progressive anorexia, weakness and weight loss. He had been hospitalized elsewhere and given blood transfusions for anemia prior to transfer to this hospital.

Physical examination showed a pale man with evidence of weight loss. The hemoglobin was 51 per cent. The urine contained blood and many white blood cells. Rectal and bimanual examination revealed a hard nodular mass of the prostate and bladder which extended 2 fingers above the os pubis.

Operation was carried out on March 2nd under general anesthesia. On opening the abdomen a tremendous mass was seen. The first stage of the operation was performed.

The postoperative course was characterized by high temperature but without severe peritoneal symptoms. On the twelfth day after operation temperature and defecation were normal. Urination was through an inlying catheter.

The second stage operation was carried out on March 20th under spinal anesthesia. Radical extirpation of the bladder and prostate was performed, followed with the transplantation of the ureters into the previously isolated ampulla recti. The abdominal wound was closed.

The patient convalesced uneventfully; on the first postoperative day urine began to pass spontaneously through the anus. On the tenth day function of the newly formed bladder occurred simultaneously with defection. On April 22nd the patient could distinguish between desire for urination and desire for defecation. Sphincter ani functioned according to his desire and need. He felt well. He was under my personal observation for twenty years. *Pathologic findings:* Microscopically, this was adenocarcinoma of the prostate

A. D., a fifty-four year old white man, was admitted to the Central Hospital of the Russian Red Cross on March 23 and was discharged on May 25, 1922. His symptoms were those of hematuria, urinary retention and suprapubic pain and weight loss.

Physical examination revealed anemia and hemoglobin 54 per cent. Urine contained blood and many white blood cells. Rectal and bimanual examination revealed a hard nodular mass of the prostate and bladder which extended 3 fingers above the os pubis.

Operation carried out on April 2nd under general anesthesia confirmed findings of tumor which involved the bladder and prostate. First stage of the operation was performed.

The postoperative period was without high temperature and without severe peritoneal symptoms. On the fourteenth postoperative day both temperature and defecation were normal; urination was via inlying catheter.

The second stage operation was carried out on April 16th under spinal anesthesia. Radical extirpation of the bladder, prostate and of lymphatic glands was performed, followed with transplantation of the ureters into the previously isolated ampulla recti. The abdominal wound was closed.

Postoperatively the patient progressed satisfactorily. On April 22nd function of the newly formed bladder occurred simultaneously with defecation. On May 5th the patient began to distinguish between desire for urination and desire for defecation. Sphincter ani functioned according to his desire and need whether it was urination or defecation. He felt entirely well. He was under my personal observation for twenty-one years. *Pathologic findings:* Microscopically, this was adenocarcinoma of bladder.

The total cases and immediate postoperative mortality may be summarized as follows: Levitsky, eight operations, one death; University clinic in Moscow, nineteen operations, four deaths. This represents an immediate mortality of 26 per cent; the main cause of death was peritoneal infection. With the use of penicillin and streptomycin today the postoperative fatalities could probably be reduced considerably.

Nothing new on the problem of transplantation of the ureters during the last quarter century has appeared in European or American medical literature, and it is hoped that this operative technic for formation of an artificial bladder will be adopted for clinical trial here in the United States.

SUMMARY

1. An attempt has been made to solve the problem of the proper method of transplantation of the ureters into the colon after extirpation of the bladder.

2. The original idea of Dr. Kodis to create an absolutely isolated artificial bladder from the ampulla of the rectum has been utilized.

3. By my own method, the resected upper part of the sigmoid colon is implanted into the rectum. The sphincter ani functions in a double capacity: (1) It serves for normal defecation and (2) it substitutes as a sphincter of the urethra for the artificial bladder.

4. The technic of the procedure is described in detail.

5. As a result of this new method the development of complications of the upper urinary tract due to infection has been minimized.

Acknowledgment. I am grateful to Drs. Philip R. Roen and Helen Z. Jern, both of the University Hospital, New York University, for their assistance in the writing of this paper.

It is well known that pelvic dissection is greatly facilitated during pregnancy by the softness of the tissues. To induce a similar state in the nonpregnant, Cromer et al. recently advised the administration preoperatively of large doses of progesterone. They have performed radical pelvic surgery on many patients with cervical epidermoid cancer after the preoperative use of large doses of progesterone and have obtained excellent results, noting especially that the operative procedure was often greatly simplified thereby. (*Richard A. Leonardo, M.D.*)

Streamlined Article

TWENTY-SIX GAUGE SPINAL NEEDLES FOR THE PREVENTION OF SPINAL HEADACHE*

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THIS study indicates that the proper insertion of small gauge spinal needles will decrease the incidence of spinal headache from the current rate of 10 to 20 per cent to 1 per cent or less. The incidence of headache following the use of the 26 gauge needle (0.69 per cent) was not much less than that following the use of the 22 gauge needle (1.05 per cent). This similarity probably resulted from the fact that the 26 needle was used more frequently in those patients known to be susceptible to spinal headache: youths, women and those subjected to surgery in or about the pelvis. Headaches following the use of the 26 needle were less severe and of shorter duration than those which developed after use of the 22 needle. Careful insertion of the needles to puncture the meninges obliquely and to split and not cut the dura was undoubtedly a major factor in the low incidence of headache with both needles. Little difficulty was encountered in using the 26 gauge needle with many technics of spinal anesthesia in a variety of patients for all types of surgery below the diaphragm. This experience convinced us that the 26 gauge needle is of definite value in avoiding spinal headache and that it may be used just as easily as ordinary spinal needles.

* * * *

Spinal headache is the most frequent and annoying complication of spinal anesthesia. It has been a problem ever since August Bier had a headache after the first attempt at spinal anesthesia in 1898.[1] In spite of this disorder spinal anesthesia has become indispensable as it provides excellent anesthesia and remarkable relaxation, with little if any visceral damage or metabolic derangement. There are rare instances of serious sequelae[2–4] but all forms of anesthesia involve grave hazards.[5–11] Spinal headache is a relatively minor complication but it assumes major proportions because it is so common and so distressing. Spinal anesthesia is often avoided or even abandoned because of this one complication. This is lamentable because it has been known for some time that the occurrence of such headaches could be minimized by the proper use of small gauge spinal needles.[12–21] The current revival of interest in these needles has stimulated this study of their practical value.

Headache is a common complication of all forms of sedation, analgesia and anesthesia. Small amounts of morphine or barbiturates, general anesthesia and brief episodes of anoxia or hypercarbia all produce "hangover headache." Headache after spinal anesthesia is often caused by the drugs used for premedication or supplementation. Headache may also develop coincidentally from a multitude of sources such as sinusitis, constipation, uremia and ileus. However, the headache produced by spinal anesthesia is unique because it is a clinical entity with definite physical characteristics. It develops within a few days of spinal tap. It is postural as it is aggravated by sitting or standing and relieved by lying flat.[22] Abdominal compression will also produce relief.[23] These signs distinguish spinal headache from all other forms of cephalalgia and should be used as the criteria for establishing the diagnosis of this

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condition. The severity and duration of spinal headache vary considerably; some patients hardly notice the pain while others suffer severely for weeks. Nausea, vomiting, tinnitus and visual disturbances accompany the headache in some instances.

There are numerous theories concerning the cause of spinal headache. (Fig. 1.) Some claim it is only a mental disturbance,[29,35,36] but the response to posture, abdominal compression and other physical effects clearly indicates that it is not an imaginary condition. Occasionally

POSSIBLE CAUSES OF SPINAL HEADACHE

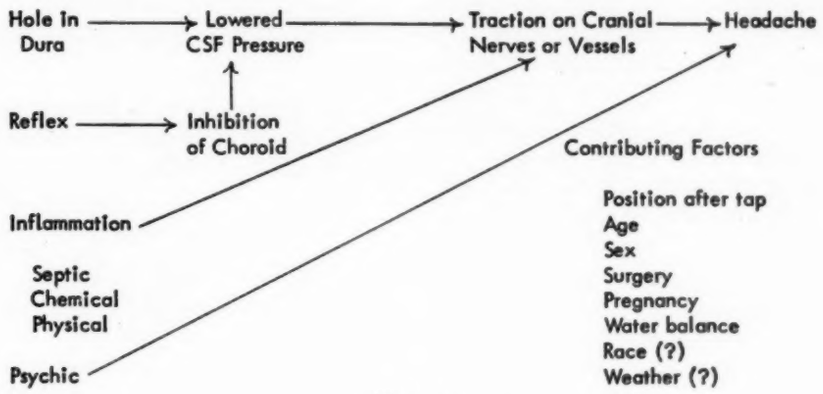

FIG. 1.

The incidence of spinal headache has been variously reported.[1,24–27] Some find it quite high while others consider it insignificant. In a review of fifty-three papers concerned with over 50,000 cases the average incidence was 18 per cent.[1] The anesthetic agent used seems to have little effect on the incidence.[1,27] In fact, there are just as many headaches after diagnostic spinal tap as there are after spinal anesthesia.[1,28–31]

Spinal headache is most apt to develop in young adults.[1,18] Studies of the incidence in children could not be found but this information might prove very useful in the study of these headaches. Two investigations of the incidence as related to sex confirmed the commonly held belief that women are afflicted more than men.[1,29] There is a clinical impression that these headaches are more common after obstetric,[19,20,23] anorectal[32,33] and pelvic surgery. Postoperative dehydration[19] and early ambulation[17,28,29,34] apparently increase the incidence of spinal headache. Other factors such as race, weather and season are mentioned but evidence concerning them is inconclusive.[1,29]

Failure to recognize the importance of these contributing factors has led to confusion concerning the true incidence of spinal headache. Confusion has also resulted from variations in the criteria used to define the disorder and in the methods used to determine its existence.

headache after spinal anesthesia may be due to inflammation induced by chemical, physical or infectious agents.[37] Such headache is not postural and is not relieved by abdominal compression. It is constant and is accompanied by definite signs of meningeal inflammation.[22] A dural reflex has been mentioned as a possible cause but evidence for this is nebulous.[38]

There is little doubt that the usual spinal headache is caused by the leak of spinal fluid through the hole made in the dura by the spinal needle. This loss of spinal fluid results in decreased spinal fluid pressure. When the upright position is assumed, the diminished volume of spinal fluid causes the brain to sag and pull on the cerebral vessels. This traction stimulates the fifth, ninth and tenth cranial nerves and the first, second and third cervical nerves, thus producing the characteristic headache. When the supine position is assumed, traction on the vessels is relieved as is the headache.[39]

The spinal fluid leak theory is strongly supported by several clinical phenomena: First, there is the impressive action of epidural or subarachnoid injections of saline in relieving spinal headache;[40,41] then there are the interesting effects of abdominal compression. It is possible to make this headache vanish and reappear by applying and releasing pressure on the lower abdomen.[23] Spinal fluid pressure is

increased by this maneuver, as is saphenous vein pressure, but pressure in the external jugular veins is decreased.[42] On the other hand, pressure exerted on the jugular veins intensifies spinal headache.[22] From these facts it may be inferred that abdominal compression causes swelling of the epidural veins which in turn compress the dural sac and force the fluid remaining in it upward to float the brain.

The spinal fluid leak theory fails to answer several questions. Why is it that all patients do not have headache after spinal tap? Why do some patients fail to have headache after repeated taps? How is it that occasional patients have headache after one tap but not after subsequent taps? It may be that the hole in the dura is usually plugged by the arachnoid and that occasionally this mechanism fails, permitting a leak of spinal fluid which produces spinal headache. It must also be considered that there may be individual variation in the response to cerebral vessel traction.

Another enigma is the greater frequency in young adults and females. The meninges of such individuals may be more elastic and thus more susceptible to dilatation and traction. The high incidence of headache after obstetric, anorectal and pelvic surgery may be related to postoperative dilatation of pelvic veins with compensatory collapse of the epidural veins and dilatation of the dural sac. This would reduce the amount of spinal fluid available for floating the brain and thus intensify spinal headache.

The leakage theory does offer a practical foundation for the prevention of spinal headache. Numerous studies have shown that the incidence of this complication can be reduced by minimizing the size of the hole in the dura with a sharp, small gauge spinal needle.[12,21,37] There is evidence that the direction of the bevel of the needle in relation to the dural fibers is important. If the bevel is inserted parallel to the fibers of the dura, most of which are parallel to the spinal cord, the needle will tend to split or spread them instead of cutting them. The wound produced is slit-shaped and small while that produced by cutting is large and tends to gape as the fibers retract.[14–19] Some have noted that if the needle is inserted obliquely into the meninges instead of at right angles, the holes in the arachnoid and dura are not opposed to each other. Leakage of spinal fluid is said to be prevented after this when the membranes are pushed together as the needle is withdrawn.[1]

Unfortunately these technics have not been generally adopted because they appeared difficult and because the leak theory failed to gain adherents. In our practice headache was the outstanding complication of spinal anesthesia and prevention was imperative. It was decided to determine the practical value of small gauge needles inserted so as to split and not cut the fibers of the dura.

TABLE 1
DISTANCE FROM SKIN TO SUBARACHNOID SPACE MEASURED IN THE LUMBAR INTERSPACES

Distance (cm.)	Patients	Distance (cm.)	Patients
3.5–4.0	3	5.6–6.0	10
4.1–4.5	6	6.1–6.5	4
4.6–5.0	18	6.6–7.0	2
5.1–5.5	15	7.1–7.5	1

The 26 gauge needle used in this study is 9 cm. long and 0.46 mm. in diameter. Experiments with fresh human dura show that punctures made with this needle are considerably smaller than those made with ordinary needles. This fine needle is so wiry and flexible that it must be inserted through a 21 gauge introducing needle which is 5 cm. long. All of the needles used were made of hyperchrome steel which resists breakage, rust and dulling.[43]

The skin of the back is widely prepared with colored zephiran solution which is allowed to dry before proceeding. Careful technic is used instead of draping which conceals landmarks and sometimes leads to contamination. The largest palpable lumbar interspace, 3, 4 or 5, is selected, a skin wheal is made in it and methedrine is injected through it into the lumbar muscles. The 21 gauge introducing needle, held with the bevel parallel to the fibers of the dura, is inserted obliquely through the wheal in the direction of the dural sac. Insertion of the introducer is limited to 3 cm. to avoid inadvertent taps. Measurements of the distance between the skin and the subarachnoid space in the lumbar interspaces were made in sixty adults. The usual depth was about 5 cm. with extremes from 3.6 to 7.5 cm. (Table 1.) The introducer is inserted a proportionate distance in children. The stylet of the 21 gauge needle is withdrawn and the 26 gauge needle is slipped through this introducer with the bevel held to split and not cut the dura. As the 26 passes

beyond the point of the 21, there is a feeling of very light resistance and the going is easy. There is usually a snap as the ligamentum flavum is pierced and there is almost always a definite snap as the dura is punctured. These sensations are more marked than those produced by ordinary spinal needles. When any snapping sensation is felt, insertion is stopped to see if the dura has been tapped. If no fluid rises in the needle and if no fluid can be aspirated, even after rotation of the needle, the stylet is replaced and insertion is continued until the dura is tapped. If no tap is made after insertion to a reasonable depth, both needles are withdrawn completely and reinserted in a more promising direction.

The small needle has a tendency to slide within the introducing needle while the anesthetic is being injected, so both needles are held firmly in the tips of the fingers of one hand which is firmly braced against the patient's back. Manual grip in this manner obviates the need of complicated retaining devices. Injection is about three times slower with the 26 than it is with the 22 and it takes about sixty seconds to inject 12 cc. of hypobaric solution through the 26. After injection a little fluid is aspirated to verify the subdural position of the needle. The spread of the anesthetic may be delayed slightly; however, quick, skillful application of the gravity principle will almost always produce the desired level of anesthesia.

The anesthetics used in this study were 1 per cent pontocaine for average cases and ½ per cent nupercaine for long cases. These were weighted with 10 per cent dextrose or lightened with water. Occasionally they were prolonged with adrenalin 1:1,000. Novocain 1 per cent was used to anesthetize the skin and ligaments at the site of the tap. All of these agents were in liquid form in ampuls which were stored in colored zephiran solution to enable detection of cracks. The needles and syringes were used exclusively for spinal anesthesia. They were maintained and washed by us personally with tap water and cotton swabs. Sterilization was accomplished by autoclaving the trays for twenty minutes.

The 26 needle was inserted with patients in a variety of positions: lateral, seated, prone-flexed and held semi-sitting, depending upon the patients and the surgery to be performed. All sorts of patients were tapped, very young and very old, robust and debilitated, flexible and arthritic. Surgery included many types of procedures from the diaphragm to the toes. Control patients were tapped with an ordinary 22 gauge spinal needle inserted to split and not cut the fibers of the dura. These patients were selected at random and included those in whom the 26 gauge needle could not be inserted. All patients were allowed to assume any comfortable position desired on return from surgery. Early ambulation either on the day of surgery or the day after was the rule. No effort was made to force fluids but adequate hydration was almost always accomplished.

All of the patients were seen regularly by one of us (C. K. O.) during the postoperative course. Questions were asked about their general condition and then an abbreviated system review was made. If no mention of headache was elicited, they were then asked directly if they suffered from headache. All headaches which were postural and relieved by abdominal compression were considered spinal headaches. Those afflicted were reassured that the condition was not serious and that it would last but a short time. Relief was obtained with abdominal binders carefully fitted over the lower abdomen or by having the patient lie flat in bed for several hours whenever headache became annoying. All patients were questioned about unusual sensation, lack of sensation and inability to move. Bladder and bowel function was also investigated.

The 26 gauge needle was used in 862 patients varying in age from five to eighty-eight years. Six spinal headaches occurred, an incidence of 0.69 per cent. The 22 gauge needle was used in 664 patients varying in age from 2.5 to eighty-eight years. Seven spinal headaches developed, an incidence of 1.05 per cent. At first glance it appears that there was little advantage in the use of the 26 needle. Further analysis, however, shows that this impression is inaccurate. The 26 gauge needle was used more than the 22 in the presence of factors known to contribute to spinal headache: youth, femininity and surgery in or about the pelvis. This compromise with scientific method was made because it was in the best interests of all concerned to avoid the production of headache.

The 26 needle was used more than the 22 in patients under fifty years of age. Nine of the thirteen patients with headaches were under fifty. In females the small needle was used more than the large needle. Seven of the thirteen

headaches were in females. In anorectal surgery the 26 needle was of decided value. Three headaches developed in 280 cases while with the 22 there were three headaches in sixty patients. The results in lower abdominal surgery were not as well defined. With the 26 needle there were three headaches in 221 cases and with the 22 there was one headache in 110 cases. Here again, however, the 26 needle was favored in young patients and in females. The age and sex distribution in transurethral, spinal and abdominal hernia surgery was almost identical for both needles. There were no headaches when the 26 needle was used but there was one headache in each category when the 22 was used. No headaches occurred in obstetric cases but the needles were used in an insignificant number of patients. There were no headaches at all in those patients subjected to upper abdominal surgery or surgery of the lower extremities.

TABLE II
INCIDENCE OF SPINAL HEADACHE RELATED TO DRUGS USED IN THIS STUDY

		Pontocaine		Nupercaine	
		Glucose	Water	Glucose	Water
Without adrenalin	22	406–3	64–3	121–1	60
	26	453–2	206–3	113–1	52
With adrenalin	22	3	1	6	3
	26	3	.....	21	14

The headaches produced with the 26 needle were less severe and of shorter duration than those which followed use of the 22 needle. Only one of the six lasted more than forty-eight hours and this lasted four days. This patient had a severe spinal headache twelve years previously and considered this one mild. Headaches with the 22 lasted two to five days and were moderate to severe in intensity. One of these had a subsequent tap with a 26 needle and did not develop a headache.

There is no doubt that other factors, such as oblique insertion and splitting the dura instead of cutting it, were important in creation of the low incidence of headache with both needles.

The 26 needle was used with surprising ease. There were 862 successful taps in 912 patients. The 22 was substituted for the 26 in forty-five patients and in many of these speed and impatience were the only reasons for change. There were five inadvertent taps with the 21 gauge introducing needle. Almost all of this difficulty occurred early in the study. There was not a single instance of needle breakage.

There were not enough headaches to analyze the effects of anesthetic drugs in producing this disorder. (Table II.) It is our clinical impression that the drugs used have nothing to do with the production of ordinary spinal headache.

In the 1,526 patients studied no major neurologic sequelae of spinal anesthesia developed in the hospital. An informal poll of surgeons, neurologists and physicians in the community has failed to disclose any delayed complications.

REFERENCES

1. THORSEN, G. Neurological complications after spinal anesthesia. *Acta chir. Scandinav.*, 95: 121, 1947.
2. KENNEDY, F., SOMBERG, H. and GOLDBERG, B. Arachnoiditis and paralysis following spinal anesthesia. *J. A. M. A.*, 129: 664, 1945.
3. KENNEDY, F., EFFRON, S. A., and PERRY, G. The grave spinal cord paralysis caused by spinal anesthesia. *Surg., Gynec. & Obst.*, 91: 385, 1950.
4. YASKIN, H. and ALPERS, B. Neuropsychiatric complications following spinal anesthesia. *Ann. Int. Med.*, 23: 184, 1945.
5. COURVILLE, C. B. Untoward Effects of Nitrous Oxide Anesthesia with Particular Reference to Residual Neurologic and Psychiatric Manifestations. Mountain View, Calif. 1939. Pacific Press Pub. Assoc.
6. THOMAS, P. Postoperative flaccid paralysis following general anesthesia. *Anesthesiology*, 11: 635, 1950.
7. ZWEIGHAFT, J. F. B. Hemiplegia following tonsillectomy. *Anesthesiology*, 10: 729, 1949.
8. WOODBRIDGE, P. D. Incidence of anesthetic explosions. *J. A. M. A.*, 113: 2308, 1939.
9. LUNDY, J. S. Convulsions associated with anesthesia. *Surgery*, 1: 666, 1937.
10. LAHEY, F. H. and RUZICKA, E. R. Experiences with cardiac arrest. *Surg., Gynec. & Obst.*, 90: 108, 1950.
11. RAVDIN, I. S., VARS, H. M. and GOLDSCHMIDT, S. Anesthesia and liver damage. *J. Pharmacol. & Exper. Therap.*, 64: 111, 1938.
12. ANTONI, N. On Lumbalpunktion. *Svenska Lakartion*, 20: 529, 1923. Quoted by Thorsen G.[1]
13. GREENE, H. M. A technique to reduce the incidence of headache following lumbar puncture. *Northwest Med.*, 22: 240, 1923.
14. SISE, L. Spinal anesthesia. *S. Clin. North America*, 6: 728, 1926.
15. KOSTER, H. and WEINTRAUB, M. Complications of spinal anesthesia. *Am. J. Surg.*, 8: 1165, 1930.
16. ALLEN, H. Headaches following lumbar puncture. *Brit. M. J.*, 2: 349, 1934.
17. DATTNER, B. Moderne therapie du neurosyphylis, 1933. Quoted by Allen, H.[16]

18. Franksson, C. and Gordh, T. Headache after spinal anesthesia: a technique for lessening its frequency. *Acta chir. Scandinav.*, 94: 443, 1946.
19. Greene, B., Goldsmith, M. and Lichtig, S. The prevention of headache after spinal anesthesia for vaginal delivery by the use of hydration and a 24 G. needle. *Am. J. Obst. & Gynec.*, 58: 709, 1949.
20. Greene, B. A 26 gauge lumbar puncture needle. *Anesthesiology*, 11: 465, 1950.
21. Cann, J. and Wycoff, C. Incidence of headache with use of a 27 gauge spinal needle. *Anesthesiology*, 11: 294, 1950.
22. Wolff, H. G. and Wolf, S. Pain. Springfield, Ill, 1948. Charles C Thomas.
23. Weintraub, F., Antine, W. and Raphael, A. Postpartum headache after low spinal anesthesia in vaginal delivery and its treatment. *Am. J. Obst. & Gynec.*, 54: 682, 1947.
24. Rovenstine, E. A. and Apgar, V. Spinal anesthesia with monocaine formate: results in 2,230 cases. *Anesthesiology*, 5: 40, 1944.
25. Babcock, W. Spinal anesthesia; experience of 24 years. *Am. J. Surg.*, 45: 571, 1928.
26. Roman, D. A. and Adriani, J. Nupercaine-glucose for spinal anesthesia: results of over 5,000 clinical administrations. *Anesthesiology*, 10: 270, 1949.
27. King, O. L. Spinal analgesia. *Ann. Surg.*, 101: 690, 1935.
28. Alpers, B. Lumbar puncture headache. *Arch. Neurol. & Psychiat.*, 14: 806, 1925.
29. Davenport, K. Post-puncture reactions. *New York State J. Med.*, 39: 1185, 1939.
30. Stokes, J. H. Modern Clinical Syphilology. Philadelphia, 1934. W. B. Saunders Co.
31. Merritt, H. H. and Fremont-Smith, F. The Cerbrospinal Fluid. Philadelphia, 1937. W. B. Saunders Co.
32. Jennings, W. K. and Karabin, J. E. Incidence of spinal headache following spinal anesthesia: 500 anorectal cases. *Am. J. Surg.*, 46: 317, 1939.
33. Lund, P. and Rumball, A. Hypobaric spinal anesthesia in 1640 cases. *Anesthesiology*, 8: 181, 1947.
34. Erskine, D. and Johnson, A. G. Lumbar puncture in out patients. *Lancet*, 2: 71, 1938.
35. Redlick, F., Moore, B. and Kimbell, I., Jr. Lumbar puncture reactions; relative importance of physiological and psychological factors. *Psychosom. Med.*, 8: 386, 1946.
36. Hebert, C., Tetrick, C. and Ziemba, J. Complications of spinal anesthesia. *J. A. M. A.*, 142: 551, 1950.
37. Babcock, W. Spinal anesthesia in fact and fancy. *Surg., Gynec. and Obst.*, 59: 94, 1934.
38. Ehrenwald, H. *Münchn. med. Wchnschnr.*, 76: 1355, 1929. Quoted by Thorsen, G.[1]
39. Ray, B. and Wollf, H. G. Experimental studies in headache. *Arch. Surg.*, 41: 813, 1940.
40. Danis, R. Sur le traitment de la céphalée succédant à l'anesthésie rachiendine. *Cong. franc. de chir.*, 380, 1928.
41. Curschmann, H. Über einige Indikationen und konta Indikationen der Lumbalpunktion. *Münchn. med. Wchnschnr.*, 1: 1308, 1910. Quoted by Thorsen, G.[1]
42. Weinstein, G., Owen, J. and Wright, C. Experience with a pneumatic abdominal binder for the relief of spinal headache. Unpublished data, 1948.
43. Schwidetsky, O. Personal communication.

Case Reports

CONGENITAL DERMOID CYST*

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ALTHOUGH congenital dermoid cysts are not rare, the one reported here is interesting because of its size, site and unusual complex nature.

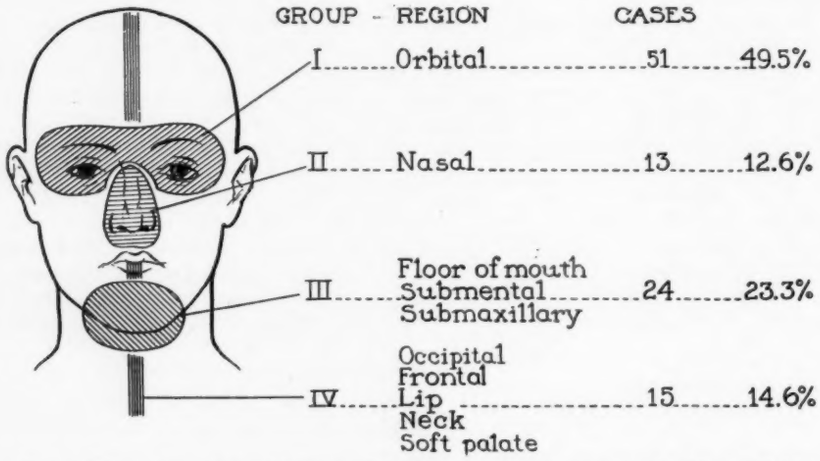

FIG. 1. Site of 103 dermoid cysts of the head and neck seen at the Mayo Clinic between 1910 and 1935. (Reproduced with permission from NEW, G. B. and ERICH, J. B. Dermoid cysts of the head and neck. *Surg., Gynec. & Obst.*, 65: 48–55, 1937.)

Congenital dermoid cysts, also known as inclusion, sequestration and fissural dermoids, are associated with embryonal disturbances of development and result from infolding of the ectoderm along the normal embryonic lines of fusion. These extragenital dermoids occur in the face, scalp, neck, back, along the median line of the thorax and in the abdomen and sacral region.

The literature[1–5,8] is somewhat confusing concerning the relationship between dermoids and teratomas as to origin, definition and classification. There seems to be no sharp dividing line, and many authors consider it unnecessary to distinguish between the two; however, for all practical purposes we prefer to define a dermoid as "a cystic tumor consisting of at least 90 per cent dermal elements."[6] This interpretation is broad enough to allow for scattering of mesodermal elements such as cartilage, bone, connective tissue and fat which occasionally are encountered in dermoids. When such elements are present, many authors refer to the tumor as a "complex dermoid" as contrasted to the "simple dermoid" which contains only skin components, that is, epidermis, derma and dermal glands.

Thus the following classification may be presented for consideration: (1) Epidermoid cyst, an epidermal-lined cyst lacking definite dermal structures; (2) dermoid cyst, a cystic tumor containing at least 90 per cent dermal elements. It may be a simple dermoid cyst containing only dermal elements, or a complex dermoid cyst containing up to 10 per cent of mesodermal elements in addition to dermal structures; (3)

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FIG. 2. Large dermoid cyst in the substance of the right cheek in an infant six weeks of age.

FIG. 3. Appearance of child at fifteen months of age.

FIG. 4. Roentgenogram of child's head and cheek (Fig. 2) showing dental tissues and calcium deposits within the dermoid.

FIG. 5. Roentgenogram of child's head and the dermoid cyst (Fig. 3) at fifteen months of age.

teratoma, a congenital tumor usually containing elements of all three germ layers and less than 90 per cent of dermal elements.

New and one of us[7] (J. B. E.) reviewed 103 cases of dermoid cysts of the head and neck. The great majority of these lesions had been noted at birth or during the first few years of life and all were related to lines of embryonic fusion. While all of the cyst cavities in this series of cases were filled with sebaceous material, only 30 per cent contained tangles of hair. Microscopically, the cysts were lined with squamous epithelium resembling skin and contained hair follicles, and sweat and sebaceous glands. Organized structures such as teeth, nails or glandular tissues were not found in any

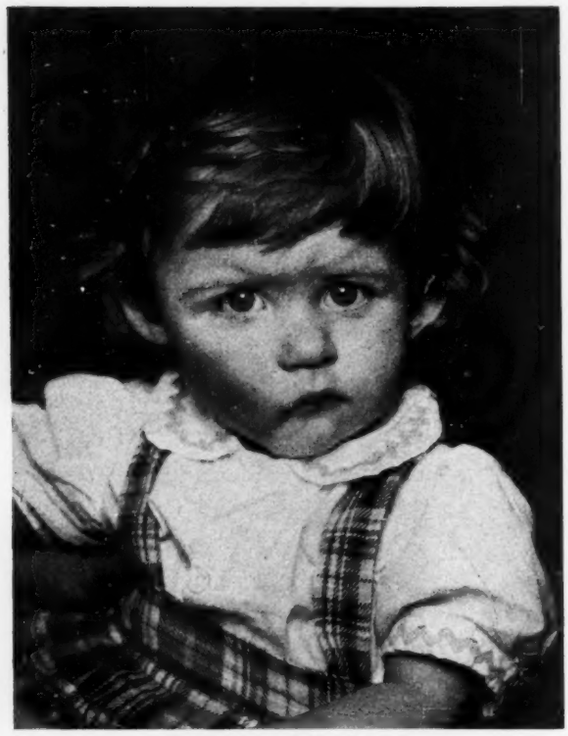

FIG. 6. Appearance of child two weeks after surgical removal of dermoid cyst. Because the nodular cystic tumor was closely integrated with the facial nerve, it was necessary to destroy the latter. This resulted in partial paralysis of the right side of the face. The appearance of the face and the scar on the right cheek can be improved later.

of these tumors. None contained bone, cartilage or lymphoid tissue with the exception of one dermoid in the orbital region in which a little cartilage was discovered. This study of dermoids involving the head and neck revealed that practically all such lesions are very simple cysts of the congenital inclusion type. The anatomic distribution of the 103 dermoid cysts reviewed is shown in Figure 1.

Branchial cysts were not included in this review because of their microscopic appearance. The authors recognized, however, that embryologically these should be considered congenital inclusion dermoid cysts arising from branchial clefts.

CASE REPORT

An infant girl was first seen at the clinic at six weeks of age because of a tumor of the right cheek which had been present at birth. Pregnancy and delivery had been normal, and the child weighed 6 pounds, 6½ ounces at birth. According to the parents the tumor seemed to be growing slowly in proportion to the growth of the child.

Our examination revealed a large tumor measuring 8 inches in circumference and involving the entire right side of the face in an otherwise normal six week old infant girl. (Fig. 2.) It was a soft, multicystic tumor containing several irregular, hard, nodular masses. Roentgenograms revealed teeth and calcium within the tumor. (Fig. 4.)

Because of potential risk of operating on an infant only six weeks of age, it was decided to defer surgical removal of this benign tumor until the child was at least one year old.

At the age of fifteen months the patient was brought back to the clinic by her parents. In the interim the child had been well, and growth and development had progressed normally. The tumor had increased proportionately and now measured 15 inches in circumference. (Fig. 3.) At that time a roentgenogram revealed a soft tissue tumor of the right cheek containing several areas of bone formation. Osseous development of the skull and facial bones appeared normal. The right mandible appeared slightly short but otherwise was normally developed. (Fig. 5.)

The preoperative diagnosis was teratoma. Under intratracheal anesthesia the tumor was removed along with a small portion of buccal mucous membrane of the cheek, which was adherent. The facial nerve was closely intergrafted with firm, nodular masses within the tumor and was destroyed. The mucous membrane was closed, and a drain was inserted into the mouth to prevent saliva from collecting in the cheek. The skin was sutured in accepted fashion and a drain placed into the dependent portion of the cheek. The child received a transfusion of 200 cc. of whole blood during the operation. Recovery was rapid and uneventful. (Fig. 6.)

The pathologic report was dermoid cyst of right cheek containing teeth, bone, hemorrhagic material, sebaceous material, hair and fat.

COMMENTS

According to the definition and classification previously mentioned this tumor is a dermoid because it contains at least 90 per cent dermal elements, and it may be called a "complex dermoid" because mesodermal elements (bone and fat) were also found. This tumor was

present at birth and appears to be related to faulty closure of the intermaxillary cleft thus classifying it as the congenital inclusion type of dermoid.

A congenital inclusion dermoid arising from the intermaxillary cleft is extremely rare, and therefore we believe this case worthy of reporting in the literature.

REFERENCES

1. Bell, E. T. A Text-book of Pathology, 4th ed., pp. 381–383. Philadelphia, 1941. Lea & Febiger.
2. Boyd, W. Surgical Pathology, 5th ed., pp. 155–158. Philadelphia, 1942. W. B. Saunders Company.
3. Ewing, J. Neoplastic Diseases: A Treatise on Tumors, chap. 49, pp. 1041–1072, Philadelphia, 1940. W. B. Saunders Company.
4. Karsner, H. T. Human Pathology, 7th ed., pp. 374–375. Philadelphia, 1949. J. B. Lippincott Company.
5. MacCallum, W. G. A Textbook of Pathology, 7th ed., chap. 72, pp. 1204–1220. Philadelphia, 1940. W. B. Saunders Company.
6. MacDonald, J. R. Personal communication to the authors.
7. New, G. B. and Erich, J. B. Dermoid cysts of the head and neck. *Surg., Gynec. & Obst.*, 65: 48–55, 1937.
8. Smith, L. W. and Galt, E. S. Essentials of Pathology, 2nd ed., chap. 36, pp. 378–380. New York, 1942. D. Appleton-Century Company, Inc.

Intrathoracic goiters eventually produce a variety of symptoms requiring surgery. Davidson and Turner recently reported a rare instance in which this growth eroded into the esophageal lumen. Biopsy of this tumor during esophagoscopy showed thyroid tissue without evidence of a mucosal covering and chest x-rays showed the presence of an intrathoracic goiter. This low grade, chronic erosion occurred without marked clinical symptoms; in fact, after biopsy (which confirmed this rare diagnosis) the patient was symptom-free and therefore refused surgery. (*Richard A. Leonardo, M.D.*)

PYOGENIC SOLITARY LIVER ABSCESS*

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THE difficulties in diagnosis encountered in solitary liver abscess are well borne out in the literature. The reports of Rothenberg and Linder,[13] and Ochsner et al.[9] indicate that this is so because of the insidious nature of onset of this disease, the lack of an antecedent history and also the failure in many cases to find an infective organism. The symptomatology early in many of the cases reported masks the picture and confuses the physician. For example, in the series reported by Rothenberg and Linder[13] of twenty-four cases of solitary liver abscess, diagnoses of seventeen cases were lesions around the right kidney, subphrenic abscess, carcinoma of the stomach, duodenal ulcer with leakage, appendiceal abscess, typhoid fever, tertiary lues and acute condition of the abdomen of undetermined cause. An early preoperative diagnosis of liver abscess was made in only seven. The lack of an immediate antecedent history prior to onset of the disease is demonstrated by Holmes,[5] who reported a case of solitary abscess of the liver coming on three to four months following a furuncle of the right forearm. Rosenthal[12] mentions a case which began one year after an appendectomy. MacKenzie and Gray[6] report a case of single pyogenic abscess occurring months after furunculosis. Rolleston and McNee[11] mention cases of solitary abscess thirty days after an attack of influenza. Morris[8] reported a case in which the swallowing of a toothpick caused a left solitary liver abscess. A blow in the right upper quadrant, according to Ochsner et al.,[9] may produce a small area of injury within the liver without damage to the capsule. In many instances there is no agreement as to the actual etiology of solitary liver abscess. The signs and symptoms, which may initially range for many weeks prior to establishing the diagnosis, confuse the clinician even more. In the cases reported by Rothenberg and Linder[13] the signs and symptoms in two-thirds of the cases of solitary abscess consisted of mild pyrexia, anorexia, weakness and malaise, diarrhea and constipation. A hacking, nonproductive cough was present in fourteen of Rothenberg and Linder's cases. In 42 per cent of Ochsner's cases the average duration of symptoms was eleven days and the longest duration was 270 days.

In Rothenberg and Linder's cases the pus in the abscess was sterile in 46 per cent of twenty-four cases of solitary liver abscess. Ochsner in a series collected up to 1938 reported the following organisms: Escherichia coli, streptococci, staphylococci and combination of the aforementioned. St. John and co-workers[14] reported anaerobic nonhemolytic streptococcus in solitary liver abscess, being the second in the literature. Baehr and co-workers[1] reported cases of abscesses with Friedländer's bacillus. Boettiger[4] and others also reported a Friedländer organism. There is a difference in opinion as to the portal of entry. Beaver[2] thought that the micro-organisms gain entry through the portal vein, the original focus having healed. Rothenberg and Linder believe that the abscesses are hematogenous in origin and come from a small and inconspicuous focus which has been overlooked, such as a furuncle.

Forgotten as the antecedent history may be and because of the failure to isolate the infective organism, the symptoms are influenced largely by the location of the abscess in the liver and the thickness of the capsule about the abscess. An abscess with a thick-walled capsule can produce little pain or none at all, except constitutional symptoms of concealed pus. There is also less chance of perforation into the body cavities. The nearer the abscess is to the surface of the liver, causing pressure of Glisson's capsule, the greater the possibility of finding a fluctuating elastic mass as well as the pain of perihepatitis.

When the cardinal symptoms of solitary liver abscess do arise, they are fever ranging from 101° to 105°F., remittent or intermittent in

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character, severe chills and drenching night sweats. Pain in the right upper quadrant becomes marked. The liver enlarges and sometimes the spleen becomes palpable. The right leaf of the diaphragm does not move freely. A hacking cough develops, known as tussis hepatica of Pel. The patient is toxic, pale and gradually becomes increasingly cachectic. Gastrointestinal signs and symptoms of anorexia, nausea, vomiting and flatulence are present. The white blood cell count is elevated. In Rothenberg and Linder's and Ochsner's cases the count averaged 16,000 to 26,924 white blood cells per 100 cm. of blood. The polymorphonuclear leukocytes averaged 86 to 89 per cent. In contrast, the count in the case presented herein was never higher than 9,990 white blood cells, with 63 per cent polymorphonuclear leukocytes.

CASE REPORT

M. I., a fifty year old white, Russian man, was admitted to Long Island College Hospital on October 15, 1950, with complaints of chills, fever, weakness and malaise of six months' duration.

The present illness started six months before when he had several grippe-like episodes, during which he noted palpitations of the heart. He became emotionally unstable and concerned about heart disease. He was given phenobarbital with very little relief. He then saw a physician who put him on propylthiouracil. He gained weight and felt much better. The basal metabolic rate was checked and found to be plus 9 per cent. Three weeks prior to admission he saw a neuropsychiatrist who advised discontinuation of propylthiouracil and who prescribed a sedative. There was some improvement and a gain of 5 pounds. Two weeks prior to admission diarrhea, aches in the knees and headaches developed. Nine days before admission he felt chilly and ran a temperature of 100°F. He felt nauseated and complained of abdominal pain. The following day his temperature rose to 105°F. and the patient was started on penicillin injections and aureomycin by mouth. In spite of these antibiotics the patient kept having daily elevations of temperature and was sent to the hospital.

Family history revealed that the patient's father had died suddenly at the age of fifty-five, cause undetermined. His mother had died of peritonitis from a ruptured appendix. One brother has heart disease. The past history was non-contributory. Systemic review was essentially negative. The patient came to the United States forty years before and had not been out of the country since. He had a steady job, smoked moderately and would drink occasionally.

On physical examination the pulse was 124, respirations 20 per minute, temperature 101°F., and blood pressure 158/65. The patient was a well developed, well nourished male in no acute distress but with an apparent stare and very apprehensive. The skin was warm and moist. There was mild exophthalmos with lid retraction; extraocular muscles were intact and the pupils reacted to light and accommodation. The fundi were normal as were the mouth and throat. There was no cervical rigidity. Cervical lymph glands were palpable, discrete, small, hard and non-tender. The thyroid gland was diffusely enlarged. Lungs were clear except for some dullness to percussion at the right base. There was a grade 1 systolic murmur at the apex of the heart and over the pulmonic area, $P_2 > A_2$. The abdomen was soft and flat, with no masses or tenderness. Liver, spleen and kidneys were not palpable. There was no costovertebral angle tenderness. Examination of the genitalia and rectum showed no abnormality. There was no swelling of joints or phlebitis. Neurologic examination showed essentially normal findings.

The temperature course throughout the patient's hospital stay ranged from 101° to 105°F., with chills accompanied by severe drenching night sweats.

Laboratory findings from October 16 to December 5, 1950, revealed the following: Red blood cells ranged from 2.84 to 4.32 million; hemoglobin, from 9.8 to 13 gm. per cent; white blood cells ranged from 6,200 to 9,900; neutrophils with marked toxic granulation, 63 per cent; lymphocytes, 28 per cent; monocytes, 4 per cent; stab forms, 5 per cent; sedimentation rate 46 mm./hr.; serology negative; platelets, 330,000. Chemistry, November 14, 1950: blood sugar, 97 mg. per cent; blood urea nitrogen, 21.1 mg. per cent; creatinine, 1.6 mg. per cent; total cholesterol, 144 mg. per cent; esters, 78 mg. per cent; plasma proteins, 6.1 gm. per cent; albumin, 4.1; globulin, 2; alkaline phosphatase, 5.8 units; cephalin flocculation, negative; seven urinalyses, negative.

December 4, 1950: cephalin flocculation, 3 plus; bilirubin, 0.62 mg. per cent; alkaline phosphatase, 10.2 Bodansky units; blood phosphorus, 4.2 mg. per cent. December 7, 1950: blood urea nitrogen, 89 mg. per cent; creatinine, 3.2 mg. per cent; icteric index, 12; CO_2 combining power, 71.6 volumes per cent; chlorides, 622 mg. per cent. December 8, 1950: blood urea nitrogen, 121.5 mg. per cent; creatinine, 4.1 mg. per cent; CO_2 combining power, 56 volumes per cent.

Blood cultures, aerobic and anaerobic, showed no growths. Agglutination tests revealed the following: typhoid, paratyphoid, brucella, proteus OX19 on two occasions, negative; heterophil tests negative; trichinosis precipitin tests positive in dilution of 1:1280. Bone marrow studies showed moderate granulocytic hyperplasia. Cervical lymph gland biopsy revealed chronic lymphadenitis. Acute pericholangitis was seen on liver biopsy. Electrocardiograms revealed sinus tachycardia, auricular fibrillation, nodal tachycardia, myocardial damage and occasional P.V.C. Skin tests were negative. Spinal fluid studies were within normal limits and malarial smears were negative.

X-rays (October 16, 1950) revealed minimal findings except for bronchitic changes in the right lower lobe. There was definite free movement of diaphragm on fluroscopy up to November 10th, with no positive evidence of any subdiaphragmatic collection. However, on November 22nd x-ray revealed definite elevation of the right diaphragm. On November 28th postero-anterior x-ray of the chest was read as a subdiaphragmatic collection with right diaphragm elevated two interspaces above the left. On December 2nd postero-anterior x-ray of the chest revealed posterior costotomy performed at right eighth rib as well as right pleural effusion and right subdiaphragmatic collection. On December 7th a fluid level was demonstrated in the liver in a cavity which measured 6 cm. in its widest diameters. Diagnosis: liver abscess.

The persistent, remittent picket type of fever continued throughout the patient's stay in the hospital, uninfluenced by large doses of all such antibiotics as penicillin, streptomycin, aureomycin and chloromycetin. Four days after admission the patient started to complain of right upper quadrant pain in the abdomen with tenderness and muscle spasm. The liver began to be just palpable. This was the first time this sign became apparent. It was only after two weeks that the liver was palpated 2 fingerbreadths below the costal margin and the spleen 1 finger on deep inspiration. The liver then began to increase in size as the disease progressed until it reached 4 fingers below the costal margin and was tender only to ulnar shock percussion. Progressive weakness and loss of weight occurred in spite of adequate diet and ten blood transfusions of 500 cc. each. Various diagnoses such as febrile Hodgkin's disease and infectious mononucleosis were then entertained, the infectious mononucleosis because of the finding of Downey cells. The white blood cell count was never high enough to suggest the diagnosis of liver abscess, never going higher than 9,990 white blood cells with 63 per cent polymorphonuclears. The patient was then subjected to a cervical biopsy which revealed chronic lymphadenitis. The heterophil reaction was negative. Because one clinician suggested the possibility of a generalized collagen disease, the patient was given ACTH and cortisone with no results except for a drop in temperature for a few days, with mild improvement for one day. Melamine by mouth was then resorted to for possible Hodgkin's disease, but to no avail. Chloroquinediphosphate, despite negative malarial smears, was then given with no reduction in the temperature. It was only after the liver began to enlarge and become tender with fixation and elevation of the right diaphragmatic leaf that a liver abscess was suspected (November 27th). Emetine, 1 gr. daily for six days, was prescribed on the possibility that the abscess was caused by amoebae, but had to be discontinued because auricular fibrillation developed at a rate of 150/min. Digitalis was then administered. Liver aspiration was performed in several locations but no pus was found. In spite of this, surgery was performed on November 30th. Right thoracotomy was performed as a first stage operation to explore the subdiaphragmatic area. On December 4th abdominal distention and respiratory difficulty developed, at which time the whole right chest was dull to percussion with absent breath sounds. The following day a second stage operation was performed and 1,000 cc. of pus were drained from the right pleural cavity. The pus was cream-like and enterococcus was cultured in large numbers. On December 7th the patient went into shock with urinary retention. On the 8th,

during a transfusion, pulmonary edema developed and the patient expired.

Autopsy was performed eleven and a half hours after death. The most striking and important lesion grossly was the presence of a rounded solitary liver abscess in the right lobe of the liver. The liver weighed 1,950 gm. The right lobe was enlarged and distorted by the presence of a discrete abscess measuring 8 cm. in average dimensions. The abscess was situated in the upper and anterior portion of the right lobe. As palpated externally, fluctuation was present in this region and the external surface near the abscess was studded with grayish brown spots. On section there were approximately 550 cc. of yellowish brown purulent exudate in the abscess. This escaped leaving a thick, hollowed cyst which showed a round, dark red and partially necrotic surface. The only other gross finding of note was the presence of approximately 1,500 cc. of thick, dark brown fluid in the right pleural cavity. No subdiaphragmatic abscess was seen and there was no direct communication demonstrable between the hepatic abscess and the right pleural sac. No peritonitis was seen.

Microscopically, the liver abscess showed considerable necrosis and fibrosis in its wall. Many areas showed a predominantly neutrophilic response. No amoebae were present in the cyst contents or wall.

Sections of lungs showed early terminal bronchial pneumonia with some neutrophils in the air spaces and some atelectasis. The right pleura showed surface fibrinous exudate.

Cultures of liver and right pleural cavity revealed no growth and anaerobic streptococci were cultured from the pericardial fluid.

COMMENTS

Bockus[3] states that pain and tenderness extending upward from an original focus of inflammation in the right lower quadrant of the abdomen, finally settling in the hepatic area, should arouse the suspicion of pyelophlebitic abscesses.

To differentiate a single pyogenic abscess from multiple abscess of the liver is difficult. However, there are some salient clinical features which suggest the diagnosis. For example, multiple liver abscesses usually have an antecedent history such as suppurative appendicitis or gallbladder disease, or suppuration in the region drained by the portal radicles. Pylephlebitis and thrombosis of the portal vein may develop. The onset is more sudden with severe chills and sweats. The multiple form of liver abscess has a higher white count. Jaundice is much more frequent in the multiple form. However, elevation of the diaphragm is not as common as is seen in large solitary abscess.

A history of dysentery and the recovery of the Entamoeba histolytica from the stool helps to differentiate amoebic abscess from pyogenic abscess.

Subdiaphragmatic abscess can be differentiated from single pyogenic abscess by the following: Hiccup and cough are more common. Limitation of motion and a bulging in the lower right thorax are seen. The right lower lobe of the lung is dull to percussion and liver dullness can extend to the third interspace. There are also diminished breath sounds and fremitus. Pleural effusion is often present, obscuring the diaphragm.

Pneumonia has been confused with hepatic abscess. The symptoms of chills and fever, pain in the right lower chest, dyspnea, cough and physical signs at the right base are all seen in solitary liver abscess. However, in pneumonia there is seldom enlargement of the liver or pain in the right upper quadrant and the diaphragm is not displaced upward.

In the weeks or months prior to establishing the diagnosis many other diseases resemble the clinical picture: febrile Hodgkin's disease with early splenic and liver enlargement; tuberculosis because of the cough, chest findings, chills and night sweats; collagen disease, such as periarteritis; febrile diseases with gastrointestinal symptoms such as typhoid and brucellosis.

When one suspects a solitary liver abscess, exploratory aspiration or needling of the liver done in an operating room is feasible. The advantage of doing this procedure in the operating room is that if pus is recovered, one can then proceed to perform the operation immediately, leaving the aspirating needle *in situ*. Even if one fails to find the pus on the initial attempt, one should not discontinue the procedure.

X-ray is unquestionably a valuable instrument in making the diagnosis of solitary liver abscess. Rothenberg and Linder noted evidence of elevation and fixation of the diaphragm in seven of seventeen patients with single pyogenic abscess. Elevation of the diaphragm is more common in abscess of the right lobe of the

liver whereas, as Miles[16] has shown, in abscess of the left lobe of the liver there is a pressure deformity, crescentic in type, on the lesser curvature of the stomach and cardia and displacement of the duodenal cap.

Another means of arriving at a diagnosis is by hepatosplenography. With thorotrast, Meredith, Cooper and Yater[7] found it of diagnostic value in four cases of solitary liver abscess. They found that with this procedure the abscess was visualized and could be differentiated from surrounding substance of the liver. There is a wide difference of opinion as to the safety of this procedure because of the fear of toxic reaction of thorium in the tissues. This chemical, taken up by Kupffer's cells, is liberated very slowly and can be present in the body for years. Yater, however, in spite of this, is a strong advocate of this procedure. However, in 1932 the Council on Pharmacy voted that thorotrast should not be used because of its activity which can increase with age. In an editorial of the *Journal of the American Medical Association* in 1937 this danger was again re-emphasized. Yater and Coe[15] in a follow-up of 286 patients over a ten-year period could find no evidence of hepatic, splenic or hematopoietic depression. There was also no evidence of latent radioactivity nor had a neoplasm developed.

SUMMARY

A case of solitary liver abscess is described and the difficulty of early diagnosis is stressed. The findings on which such a diagnosis could be suggested are indicated and the differential diagnosis discussed.

REFERENCES

1. Baehr, G., Schwartzman, G. and Greenspan, E. B. Bacillus Friedländer abdominal infections due to perforative lesions of the intestinal tract. *J. Mount Sinai Hosp.*, 4: 225, 1937.
2. Beaver, D. C. Granulomatous abscess of liver at pyogenic origin. *Am. J. Path.*, 7: 259, 1931.
3. Bockus, H. L. Gastroenterology, vol. 3. Philadelphia, 1946. W. B. Saunders Co.
4. Boettiger, C. et al. Primary suppuration of liver due to Friedländer's bacillus. *J. A. M. A.*, 114: 1050, 1940.
5. Holmes, A. H. Non-tropical solitary liver abscess. *Brit. M. J.*, 2: 991, 1934.
6. MacKenzie, W. C. and Gray, H. K. Single pyogenic abscess of liver, report of case. *Proc. Staff Meet., Mayo Clin.*, 12: 596, 1937.
7. Meredith, R. H., Cooper, L. F. and Yater, W. M. Thorotrast hepatosplenography as diagnostic aid in solitary liver abscess, report of 4 cases. *M. Ann. District of Columbia*, 11: 382, 1942.
8. Morris, R. W. Liver abscess. *J. A. M. A.*, 114: 2369, 1940.
9. Ochsner, A., DeBakey, M. and Murray, S. Pyogenic abscess of liver. II. Analysis of 47 cases with review of literature. *Am. J. Surg.*, 40: 292, 1938.
10. Reeves, D. L. and Stuck, R. M. Clinical and experimental results with thorotrast. *Medicine*, 17: 37, 1938.
11. Rolleston, H. and McNee, J. W. Diseases of Liver, Gall Bladder and Bile Ducts. London, 1929. Macmillan & Co. Ltd.
12. Rosenthal, E. Diseases of Digestive System. St. Louis, 1940. C. V. Mosby Co.
13. Rothenberg, R. E. and Linder, W. Single pyogenic liver abscess—study of 24 cases. *Surg., Gynec. & Obst.*, 59: 31, 1934.
14. St. John, F. B., Pulaski, E. J. and Ferrer, J. M Primary liver abscess due to anaerobic nonhemolytic streptococcus. *Ann. Surg.*, 116: 217, 1942.
15. Yater, W. M. and Coe, F. M. Ten years' experience with thorotrast hepatosplenography. *Ann. Int. Med.*, 18: 350, 1943.
16. Miles, J. M. Roentgenological diagnosis of abscess on concave surface of liver. *Am. J. Roentgenol.*, 35: 65, 1936.

LIGATION OF ACCIDENTALLY TORN HEPATIC ARTERY*

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IN this article the author presents a case in which the common hepatic artery was ligated with no apparent ill effects on a previously normal liver.

E. T., a rather obese forty-three year old housewife, underwent cholecystectomy under ethylene-ether anesthesia. A cherry-sized stone was firmly impacted in the neck of the gallbladder. While the latter was mobilized from the fundus down and traction was applied on the impacted stone to facilitate dissection, a sudden release was felt, following which the gallbladder appeared free and connected with the common bile duct only by a rather long cystic duct. At the same time vigorous arterial bleeding appeared from the region of the hepatoduodenal ligament, apparently from a torn cystic artery. This was stopped by digital compression of the hepatoduodenal ligament. The cystic duct was ligated and the gallbladder excised in order to obtain a better exposure for hemostasis. At this point the author was asked to take over the repair.

Digital compression of the hepatoduodenal ligament checked the bleeding only if performed close to the duodenum. However, the bleeding artery could not be visualized, and the bleeding seemed to be dorsomedial to the common duct, rather close to the duodenum. Finally, the bleeding point was found to be under the compressing finger. Gradual release of compression, which usually allows visualization of a spurting vessel, was therefore of no avail. After releasing the compression massive hemorrhage flooded the exposed area before a hemostat could be applied. It was evident now that the hemorrhage did not originate from the cystic artery but from the hepatic artery which had been torn in the hepatoduodenal ligament. Finally a hemostat was successfully applied under the compressing finger but attempts to place a ligature around the arterial clamp failed and the hemostat came off.

Although the patient received blood continuously, her pressure dropped sharply. After two 8 inch hemostats had secured the bleeding artery, no further attempt at ligation was undertaken. The hemostats were left *in situ*, a gauze pack was placed under the liver and the abdomen was closed. The patient received more blood, fortified penicillin 600.000 units twice a day and streptomycin 1 gm. daily.

Her general condition improved gradually, and the blood pressure returned to normal within twenty-four hours. She complained of abdominal pain and a severe backache, necessitating frequent injections of morphine. On the following morning urinalysis showed no bile in the urine and normal urobilinogen. The fasting blood sugar was 103 mg. per cent, blood urea 8 mg. per cent, cephalin flocculation 2+ and icteric index 6.25.

Three days later the abdomen was re-opened under cyclopropane anesthesia. The gauze pack was removed and the hepatoduodenal ligament with the hemostats on the hepatic artery was exposed. When the clamps were opened, profuse arterial bleeding started immediately. This was checked by digital compression of the hepatoduodenal ligament, and clamping and ligature of the bleeding artery was attempted. After several unsuccessful attempts it became obvious that the hepatic artery had to be tied in its proximal portion. The common hepatic artery was exposed through the prepyloric portion of the hepatogastric ligament and a hemostat was applied to it; this stopped the hemorrhage immediately. Two suture ligatures were placed around the clamp and the latter was removed uneventfully. Two penrose drains were inserted and the abdomen closed in layers. The patient received 1,000 cc. of blood during the operation, 500 cc. that same afternoon and 500 cc. the next morning. She was given 600.000 units of fortified penicillin twice a day, 1 gm. of streptomycin daily for seven days and 500 mg. of terramycin intravenously daily for four days.

The postoperative course was uneventful. A small amount of serosanguinous fluid drained from the penrose tubes which were shortened

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gradually and removed on the tenth day. The patient passed gas on the third postoperative day and was able to get out of bed on the fourth day. Sutures were removed on the twelfth day when the patient left the hospital in good condition.

Laboratory Data. Two days after the second operation blood urea was 10.5 mg. per cent, icteric index 6.25, cholesterol 168 mg. per cent with 62 per cent esters, cephalin flocculation negative, serum amylase 224. Three days later serum amylase was 157 and prothrombin time twenty-one seconds (fifteen seconds normal control). Eleven days after the second operation fasting blood sugar was 123 mg. per cent, cholesterol 185 mg. per cent with 52 per cent esters, cephalin flocculation 1+, bromsulfalein test 70 per cent retention after five minutes and no retention after thirty minutes, total proteins 4.82, A-G ratio 3.7/1, serum amylase 206.

COMMENTS

Bleeding from the hepatic artery which had been torn accidentally was stopped by ligation of the common hepatic artery. This was tolerated well and had no harmful effect on the liver as far as could be determined by function tests. The only abnormal finding was the low total protein. Serum amylase levels were elevated slightly on two occasions.

Ligation of the hepatic artery is dreaded because it may be followed with necrosis of the liver. As early as 1906 Haberer[1] demonstrated that ligation of the hepatic artery at the celiac axis can be done without fear of liver necrosis, while ligation beyond the right gastric or the gastroduodenal artery is dangerous and may lead to hepatic necrosis.

Markowitz and colleagues[2] have shown recently that administration of penicillin prevented liver necrosis following ligation of the hepatic artery in the dog. Other authors[3–6] have studied in dogs the effects of complete ligation of the hepatic artery. Jefferson, Proffitt and Necheles[6] concluded that antibiotics such as penicillin or terramycin protected animals against death from complete excision of the hepatic arterial trunk, but that a number of animals would survive even without antibiotics in the presence of adequate collateral circulation to the liver from the phrenic arteries.

Rienhoff[7] and Berman[8] have reported on a number of cases of liver cirrhosis in which ligation of the hepatic and the splenic arteries was performed for the relief of portal hypertension. Rienhoff prepared his patients with antibiotics for one week before operation and continued with the medication postoperatively for a few days. He ligated the hepatic artery distal to the origin of the gastroduodenal artery. Berman performed the ligation close to the celiac axis and administered antibiotics postoperatively for a number of days. These reports show that ligation of the hepatic artery has no ill effect on the cirrhotic liver and that, combined with ligation of the splenic artery, it may prove to be a simple surgical approach to the treatment of portal hypertension.

In the case reported herein ligation of the hepatic artery was performed in the presence of a normal liver, while the cases of Rienhoff and Berman had cirrhotic livers. Haberer[1] has stated that arterial occlusion is tolerated better in cases of aneurysm or other impairment of the hepatic artery than in normal cases. A certain amount of circulatory deficiency of the liver is to be expected in liver cirrhosis and portal hypertension. In our patient clamping and later ligation of the hepatic artery had no ill effect on a normal liver with an apparently normal circulation as far as could be determined by various liver function tests.

Liberal amounts of antibiotics were given in the aforementioned case just as in Rienhoff's[7] cases. In animal experiments death from liver necrosis can be prevented by administration of antibiotics as Markowitz and colleagues[2] have pointed out, but it has not been established yet whether or not this applies to man too. In any case antibiotics can prevent death only if an adequate collateral circulation develops. Jefferson and colleagues[6] have stated that complete interruption of arterial supply to the liver through the hepatic artery and all collaterals will inevitably lead to necrosis of the liver and subsequent death in the dog as well as in man.

In our case the hepatic artery was ligated close to the celiac axis. A more marked interference with the arterial blood flow to the liver, which is probably desirable in portal hypertension, is achieved if the ligation is performed closer to the liver, for example, distal to the gastroduodenal artery as in Rienhoff's cases. Yet, anatomic variations and systemic arterial disease may prevent the formation of adequate collateral channels from the superior and inferior phrenic arteries which, according to Jefferson and colleagues,[6] supply arterial blood to the

liver after complete excision of the hepatic artery. Following ligation of the hepatic artery near the celiac axis, arterial circulation to the liver usually occurs by reversed flow through the right gastric or the gastroduodenal artery by way of anastomoses with the left gastric artery and branches of the splenic and the superior mesenteric arteries. This will prevent ischemia of the liver even if collaterals from the phrenic arteries are inadequate or absent.

REFERENCES

1. Haberer, H. Experimental ligation of the hepatic artery. *Arch. f. klin. Chir.*, 78: 557–587, 1906.
2. Markowitz, J., Rappaport, A. and Scott, A. C. The function of the hepatic artery in the dog. *Am. J. Digest. Dis.*, 16: 345–348, 1949; Markowitz, J. and Rappaport, A., The hepatic artery. *Physiol. Rev.*, 31: 188–204, 1951.
3. Tanturi, C., Swigart, L. L. and Canepa, J. F. Prevention of death from experimental ligation of the liver (hepatic proper) branches of the hepatic artery. *Surg., Gynec. & Obst.*, 91: 680–704, 1950.
4. Grindlay, J. H., Mann, F. C. and Bollman, J. L. Effect of occlusion of the arterial blood supply to the normal liver. *Arch. Surg.*, 63: 806–811, 1951.
5. Fraser, D., Rappaport, A. M., Vuylsteke, C. A. and Colwell, A. R. Effects of the ligation of the hepatic artery in dogs. *Surgery*, 30: 624–641, 1951.
6. Jefferson, N. C., Proffitt, M. M. and Necheles, H. Collateral arterial circulation to the liver of the dog. *Surgery*, 31: 724–730, 1952.
7. Rienhoff, W. J., Jr. Ligation of the hepatic and splenic arteries in the treatment of portal hypertension with a report of six cases. *Bull. Johns Hopkins Hosp.*, 88: 368–375, 1951.
8. Berman, J. K. Discussion of Grindlay, Mann and Bollman's paper;[4] Berman, J. K., Koenig, H. and Muller, L. P. Ligation of hepatic and splenic arteries in treatment of portal hypertension. *Arch. Surg.*, 63: 379–389, 1951; Berman, J. K., Muller, L. P., Fisch, C. and Martz, W. Ligation of the hepatic and splenic arteries in a patient with atrophic cirrhosis of the liver. *Arch. Surg.*, 63: 623–628, 1951.

INTERSTITIAL HERNIA AND HERNIA THROUGH THE CONJOINED TENDON*

C. M. KEMPER, M.D., J. W. GROSSMAN, M.D. AND J. E. MUSGROVE, M.D.
Albuquerque, New Mexico

THE following case report is presented because of the combination of two unusual hernias.

FIG. 1. Herniated loop of sigmoid colon. Arrow indicates the constriction at the neck of the hernial sac.

M. C. A., a sixty-six year old white woman, came under our care on July 3, 1951, with a main complaint of arthritis of five years' duration. She also stated that she had been having attacks of pain in the left lower quadrant for twenty-seven years. The history relating to this second complaint is very interesting. In 1923 when attempting to "pump the pedals of an old sewing machine" she felt a sudden sharp pain in the left lower abdomen. She made her way to bed with some difficulty and after lying down for an hour the pain gradually eased off, leaving her with some residual soreness for the next few days. Since that time she had had recurring episodes of left lower quadrant pain on an average of one to two times a month. The pain had been associated with nausea, occasional vomiting and obstipation. She had learned that by lying down, applying heat and massage and taking a warm water enema she could abort the attacks of pain and get her bowel functioning normally.

From 1923 to 1928 she was examined by four physicians and the fourth doctor operated upon her with "release of adhesions and partial removal of the left ovary." Following this operation she was free of pain for two months; then the attacks of left lower abdominal pain recurred the same as before surgery. In the intervening years, from 1928 to 1951, she was examined on many occasions by six different physicians, none of whom found the source of her trouble. During the past year the attacks had become more frequent and the pain more severe and more difficult to relieve.

On examination the patient was moderately obese; she was 63 inches in height and weighed 161 pounds. Abnormal physical findings were limited to her joints and left lower abdomen. The knee and interphalangeal joints were slightly enlarged with moderate limitation of motion. The abdominal findings were as follows: The abdominal wall was rather protuberant, with a moderately thick panniculus across the lower abdomen. There was no visible swelling in the left lower quadrant but on careful palpation an indistinct mass approximately 5 by 3 by 2 inches could be felt. The mass was slightly tender but by gentle compression between the thumb and fingers it could be reduced in size and an occasional gurgling sound could be heard. When the patient stood up, the mass would regain its previous dimensions. With the abdominal wall taut, as by stiff leg raising, no abnormality could be felt.

* From the Lovelace Clinic, Albuquerque, N. Mex.

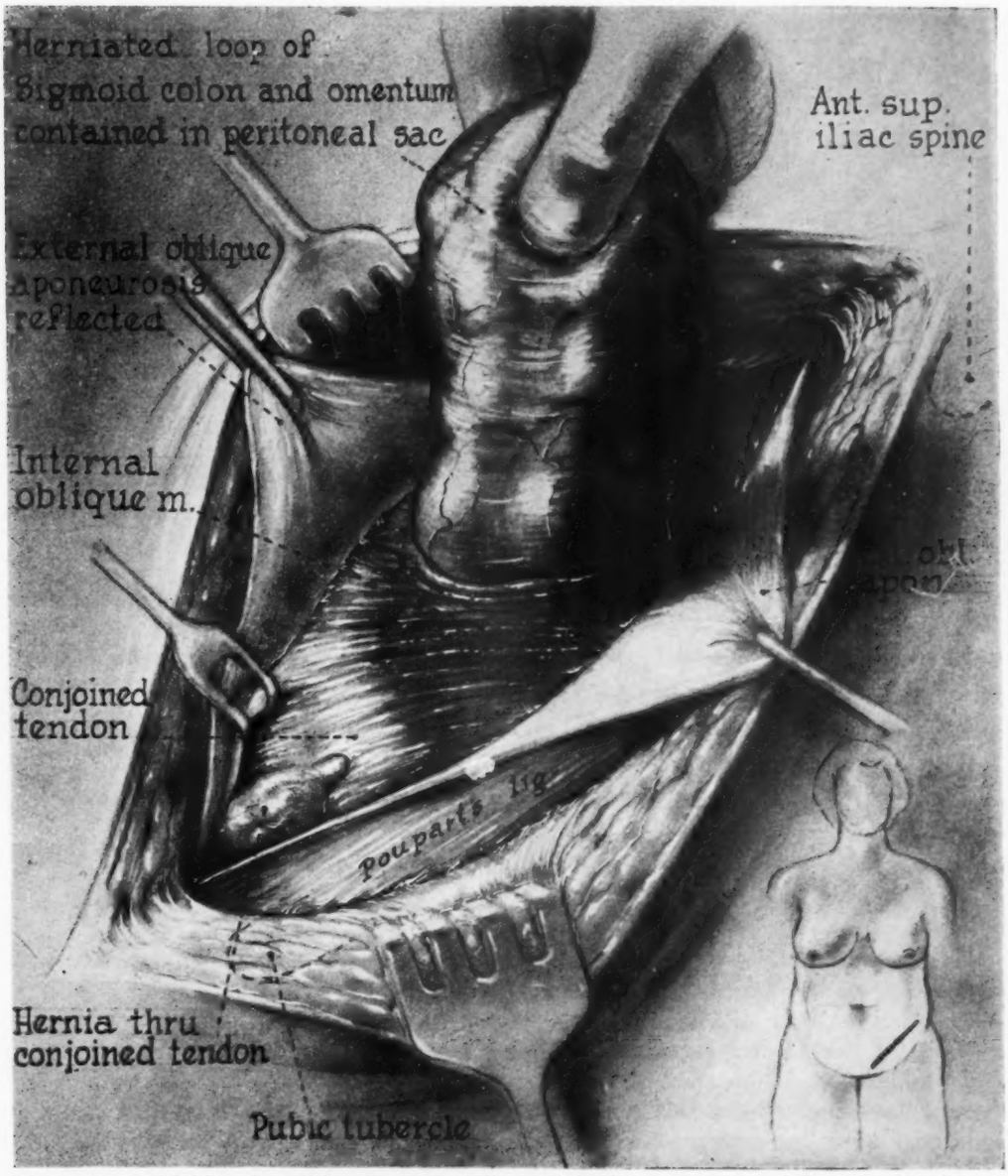

FIG. 2. Interstitial hernia and hernia through the conjoined tendon as seen following reflection of the external oblique aponeurosis.

At the conclusion of the examination the impression was that the patient was suffering from degenerative arthritis and interstitial hernia of the left lower abdomen.

Routine laboratory studies of the blood and urine were within normal limits and the sedimentation rate was slightly elevated. Barium enema studies disclosed an irritable colon, with marked diverticulosis and herniation of a portion of the sigmoid colon in the left iliac region. Oblique films of the lower abdomen disclosed the herniated colon very well. (Fig. 1.)

Operation was performed on August 7, 1951. Under gas-oxygen-ether anesthesia the left inguinal region was exposed through an incision slightly higher and longer than the usual hernial incision. When the aponeurosis of the external oblique muscle was exposed, it was found to be bulging forward in the region above the site of the internal inguinal ring. The aponeurosis overlying this protuberance was divided in the direction of its fibers, exposing quite a large hernial sac. (Figs. 2 and 3.) The sac was readily freed from the surrounding structures by blunt dissection and when opened was found to con-

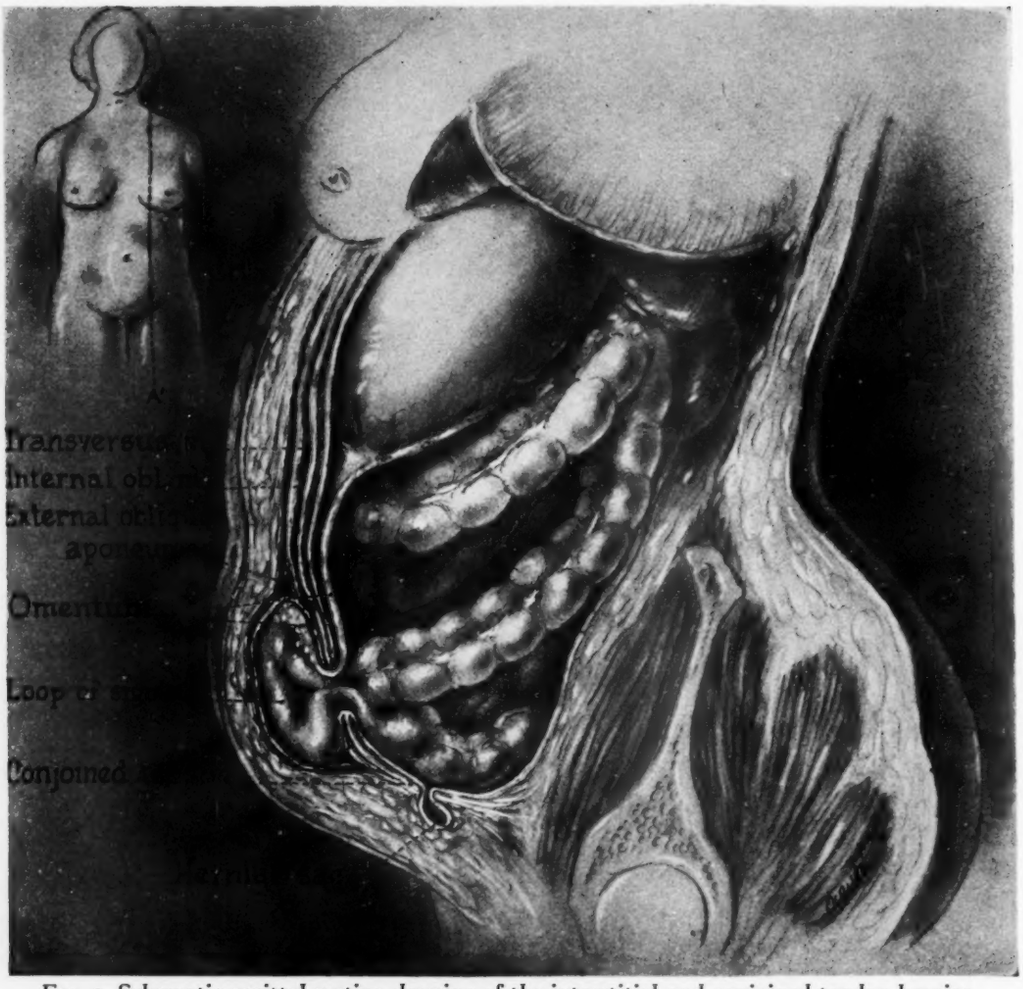

FIG. 3. Schematic sagittal section drawing of the interstitial and conjoined tendon hernias.

tain a portion of the greater omentum and a loop of sigmoid colon. There were numerous diverticula of the sigmoid colon but no signs of diverticulitis. The colon and omentum were replaced within the abdominal cavity without difficulty. On further exploration of the inguinal region a small hernial sac was found protruding through a well developed conjoined tendon. (Figs. 2 and 3.) The hernial orifice was approximately 8 mm. in diameter; the edge of the opening was round and firm and felt as though a hole had been punched through the conjoined tendon. This small sac was reduced within the abdominal cavity, and the opening in the conjoined tendon closed with three interrupted silk sutures. The neck of the large sac, which was 1½ inches in diameter and lying 1 inch above the internal abdominal ring, was closed by a running chromic catgut stitch, the sac excised and the same stitch run back as a second layer of closure. The transverse and internal oblique abdominal muscles were then approximated with interrupted chromic catgut sutures and this weak area was reinforced by turning down a flap of rectus sheath, suturing the latter to the reflex portion of the inguinal ligament with interrupted silk sutures. The upper leaf of the external oblique aponeurosis was sutured with interrupted silk sutures to the shelf of the inguinal ligament and the lower leaf plicated over the upper aponeurotic leaf. The subcutaneous tissues and skin were closed in the routine manner.

The patient was ambulant the morning following surgery and had a satisfactory postoperative convalescence. When last seen November 1, 1951, she was feeling well and was a very grateful patient. The wound was well healed with no evidence of weakness in the left lower abdominal wall.

COMMENTS

Watson[1] defines interstitial or interparietal hernia as follows: "Interstitial hernia is a hernia that lies in one or other of the planes of the abdominal wall." This is an all-inclusive definition that will apply to the various types of interstitial hernias. These hernias are usually found in the inguinal region, the neck of the sac passing through the internal inguinal ring, the sac then being diverted to occupy the following positions: (1) between the peritoneum and the transversalis fascia—properitoneal hernia, (2) between the muscles of the abdominal wall, the sac most commonly lying between the external and internal oblique muscles—intermuscular hernia and (3) the sac passes through the external oblique aponeurosis to lie in the subcutaneous fat—superficial inguinal hernia. These are subclassifications of interstitial hernia.

However, all interstitial hernias do not have their point of origin at the internal inguinal ring, as attested by the case reported herein and by similar cases recorded by Cattell and Aronoff[2] and by Lower and Hickem.[3] This type of hernia has been thought to be due to a congenital peritoneal pouch lying above the internal inguinal ring. These hernias will also follow previous abdominal incisions on rare occasions.[4]

Hernia through the conjoined tendon is a term that well describes the hernia seen in the case we are recording. Mathews[5] gave an excellent description of this hernia in 1923. It has also been named hernia of the linea semilunaris[5,6] but this latter term is not as descriptive, for hernias may occur throughout the length of the semilunar line. This hernia is usually recorded as a direct inguinal hernia, for its site of origin is medial to the epigastric vessels, but it differs from the usual direct inguinal hernia in several important particulars. Direct hernia has a wide neck while hernia through the conjoined tendon has a narrow, firm neck which readily leads to strangulation. Direct hernia is often bilateral while conjoined tendon hernia is unilateral. The latter hernia is easily repaired while the direct hernia is more difficult to repair and has a much higher recurrence rate. Hernia through the conjoined tendon is not common but neither is it rare, this being the third time one of us (J. E. M.) has encountered such a hernia.

REFERENCES

1. Watson, L. F. Hernia, 3rd ed., St. Louis, 1948. C. V. Mosby Co.
2. Cattell, R. B. and Aronoff, B. L. An unusual hernia producing abdominal pain. *S. Clin. North America*, 24: 731–732, 1944.
3. Lower, W. E. and Hickem, N. F. Interparietal hernias. *Ann. Surg.*, 94: 1070, 1931.
4. Fisher, H. C. Interstitial inguinal hernia. *Ann. Surg.*, 123: 419, 1946.
5. Mathews, F. S. Hernia through the conjoined tendon or hernia of the linea semilunaria. *Ann. Surg.*, 78: 300, 1923.
6. Downes, W. A. Management of direct inguinal hernia. *Arch. Surg.*, 1: 53, 1920.

New Instruments

SLIDER RINGS, A NEW METHOD OF SIGMOIDOSCOPIC MEASUREMENTS

NORMAN L. FREUND, M.D.
Brooklyn, New York

IT had been our custom when performing a sigmoidoscopic examination to use a darkened room for better visual contrast. When a lesion was encountered, even though calibrated endoscopes were used, it had been necessary to turn on the room lights so that the height of the lesion could be determined. Then the lights were again extinguished until the examination was completed.

This inconvenience and loss of time has been eliminated by devising a ring which fits on and slips over the outside of the sigmoidoscope, and which slides down to the anus and remains at that point on the endoscope until the procedure is completed. The level of the lesion is then accurately determined after the removal of the instrument. This method also obviates the necessity of calibrating the sigmoidoscopes and insures a less costly armamentarium, as the slider rings are inexpensive compared to the cost of calibration.

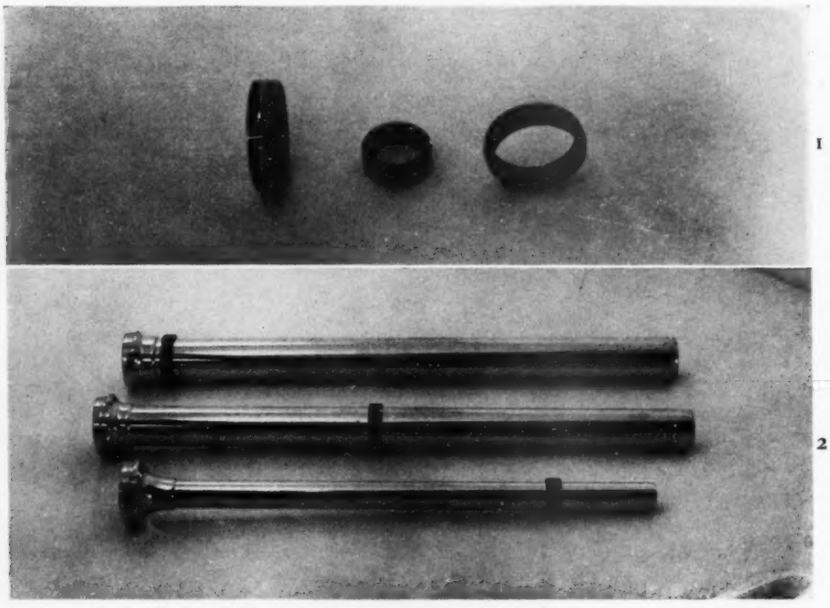

FIG. 1. Three different-sized rings.

FIG. 2. Rings in various positions.

The slider rings are made of a special black plastic which contrasts with the plated finish of the metal sigmoidoscope. Each ring is an incomplete circle with a polished wire spring in a groove that holds it snugly in place. This also permits the ring to be moved easily up or down, with or without a lubricant, and to retain its position when placed anywhere on the instrument. Sterilization by boiling and in strong cold solutions of detergicide, zephiran chloride or lysol has not affected the use of this

method or caused any change or deterioration in the material, its color or shape. Each ring is ¼ inch wide. They are made in five sizes, namely, ½, ⅝, ¾, ⅞, and 1 inch.

The slider ring* is spread slightly and sprung over the distal tip and then slipped back against the collar, out of the way, at the proximal end of the sigmoidoscope before the instrument is inserted. The ring can then be moved down easily against the anus when a level of height is desired. Figures 1 and 2 show the rings and illustrate how they fit and are slid over the endoscopes.

* Grateful acknowledgment is accorded to Don Cammon of the Cameron Surgical Specialty Co. for invaluable assistance in the design and manufacture of these rings.

BIOPSY of the cervix for a tiny, suspicious lesion occasionally is followed by a mistaken diagnosis of intraepithelial carcinoma, according to Novak and Galvin. This occurs because varying degrees of hyperactivity of the basal cells often simulate malignancy. The authors, therefore, wisely recommend that repeated biopsies or even conization of the cervix be done first and if intraepithelial carcinoma appears manifest in all these specimens then, and not before, should radical surgery be recommended. (*Richard A. Leonardo, M.D.*)

A BLUNT-POINTED CURVED SCISSORS*

PHILIP THOREK, M.D.
Chicago, Illinois

ONE hesitates to use the word "new" in describing armamentarium of any type. The originator of a "new" idea too often finds that the same or similar instrument was described earlier. Although certain eye, throat and uterine scissors may bear a resemblance to the one about to be described, they nevertheless do not fulfill the necessary prerequisites.

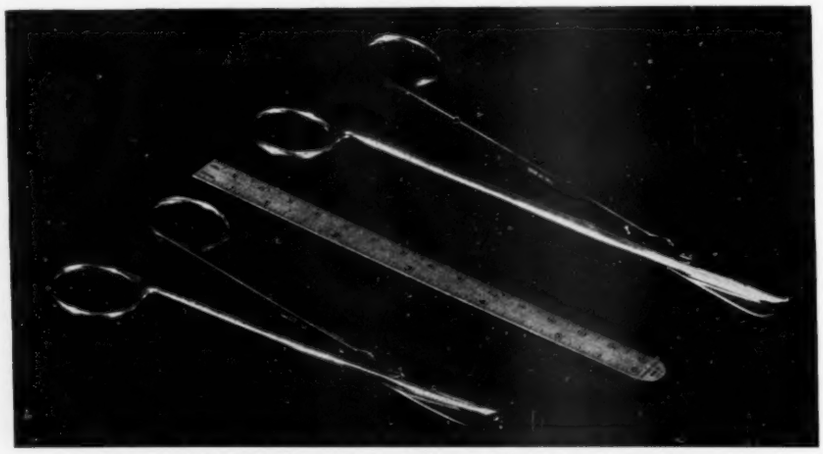

FIG. 1. The 5½ and 7¼ inch blunt-pointed curved scissors.

Those interested in general surgery soon learn that right-angled hemostats such as Mixter or tonsil forceps have distinct advantages over the conventional types of straight or curved hemostats. With the right-angled type of instrument it is much easier to clamp such structures as superior thyroid vessels, cystic ducts and arteries, and gastric and uterine vascular pedicles. Not only is it easier to grasp these structures but also placing a ligature beneath such a hemostat is greatly simplified. As a result of this the right-angled type of forceps has come into greater usage.

One need only clamp a superior thyroid pedicle or cystic duct with right-angled forceps and then attempt to cut between these with the standard straight or curved scissors to realize the inadequacies of such a scissors. The usual straight scissors will surely never fit between two Mixter forceps, and even the curved surgical scissors require awkward hand and wrist movements to sever the tissue between such forceps. It was with this thought in mind that a right-angled scissors was devised and constructed which would fit between the curve of Mixter forceps, and thus being once engaged would cut the tissue without necessitating any additional manipulation of the surgeon's hand or fingers.

Such scissors were constructed in two lengths, a 7¼ inch length and a 5½ inch length. (Fig. 1.) In the course of working with these scissors it was found that they could be used admirably as dissecting scissors. This was particularly noted while performing a cholecystectomy and dissecting the serosa free of the underlying muscularis so that peritoneal flaps could be formed. It was soon learned that the scissors could be used for both blunt and sharp dissection, particularly where there was a bend or an angle. It was necessary, however, to have the points of the instrument made blunt so that there would be no sticking or rupture of surrounding structures.

For the past three years these scissors have been used routinely. A few uses are depicted in

* From the Departments of Surgery, University of Illinois, Cook County Graduate School of Medicine, Cook County Hospital, American and Alexian Brothers' Hospitals, Chicago, Ill.

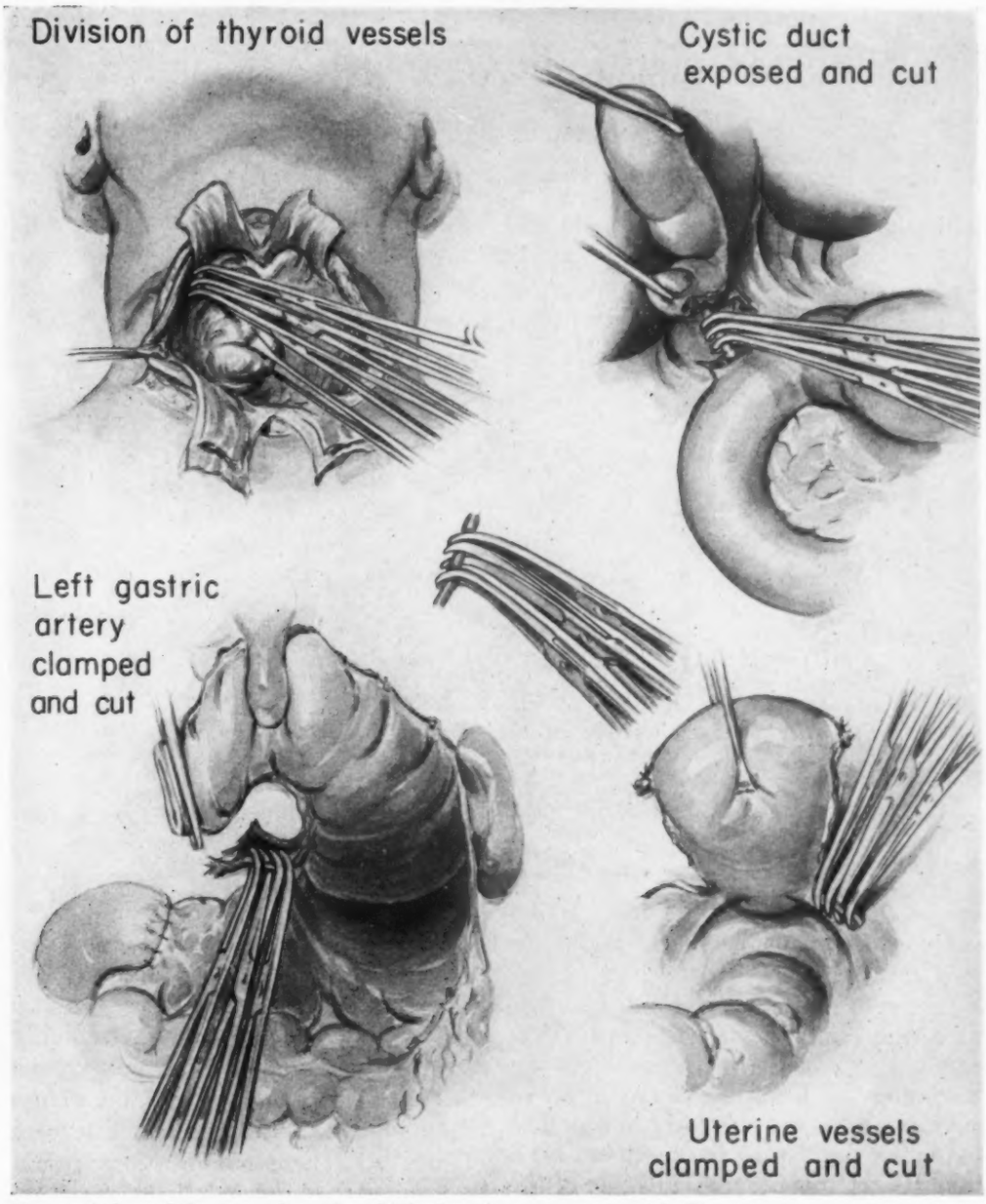
Division of thyroid vessels
Cystic duct exposed and cut
Left gastric artery clamped and cut
Uterine vessels clamped and cut

FIG. 2. A few of the procedures in which the scissors prove useful. The insert shows the scissors between two right-angled clamps.

Figure 2 as applied to the superior thyroid vessels, cystic duct, left gastric artery and uterine vessels.

This instrument is not meant to replace the standard straight and curved scissors that the surgeon uses in the course of routine surgery. However, if present as part of the surgeon's armamentarium it should expedite the execution of some steps in many routine operative procedures.

A MODIFIED CLIP-APPLYING FORCEPS*

WILLIAM P. KLEITSCH, M.D.
Omaha, Nebraska

IN doing dorsolumbar sympathectomies the surgeon finds himself working deeply within a small cavity. It is necessary for him, as part of the procedure, to identify the cut ends of the sympathetic chain with silver or tantalum clips. It is sometimes necessary to use such clips for hemostasis. Two types of clip-applying forceps are currently in use. The type devised by Smithwick has a curved beak which permits sighting along the handle of the forceps and brings the beak of the instrument carrying the clip into view. Unfortunately this maneuver also brings the surgeon's hand between his eye and the handle of the forceps and obscures his direct vision. The clip-applying forceps of Sweet has a curve in the handle which removes the surgeon's hand from the field of vision when he sights down the handles. Unfortunately, however, this instrument does not have a curve in the beak so that when the surgeon sights along the handles, the handles themselves interfere with clear visualization of the beak of the instrument.

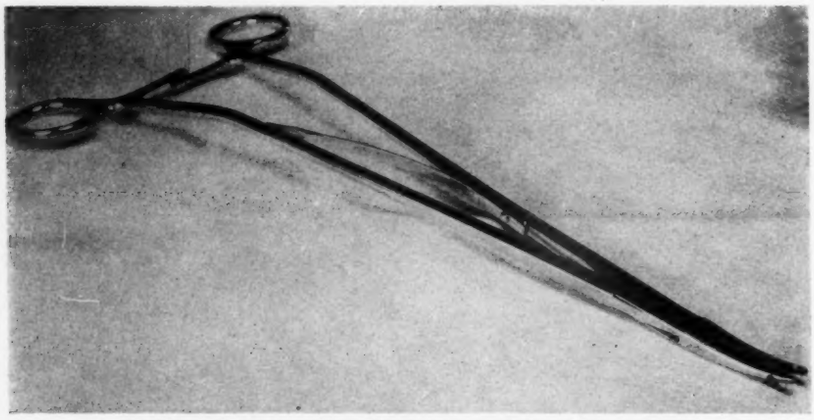

FIG. 1. A photograph of the modified clip-applying forceps illustrating the curved beak and off-set handles.

FIG. 2. A line drawing of the instrument which demonstrates somewhat more clearly the modifications in design.

A forceps has been devised which consists essentially of a 10½ inch clip-applying forceps which has a curve in the handle similar to the Sweet clip-applying forceps and a curve in the beak similar to the Smithwick forceps. (Figs. 1 and 2.) These modifications result in (1) removing the surgeon's hand from the direct line of vision along the handle of the instrument and (2) bringing the beak of the instrument into view so that it can be directly visualized while sighting along the handles. This instrument has been found invaluable in doing transthoracic dorsolumbar sympathectomies. It should be of value in any operation in which hemostatic clips must be applied in the base of deep and narrow cavities.

* From the Department of Surgery, Creighton University School of Medicine, and the Veterans Hospital, Omaha, Neb. Sponsored by the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions published by the author are a result of his own study and do not necessarily reflect the opinion or policy of the Veterans Administration.

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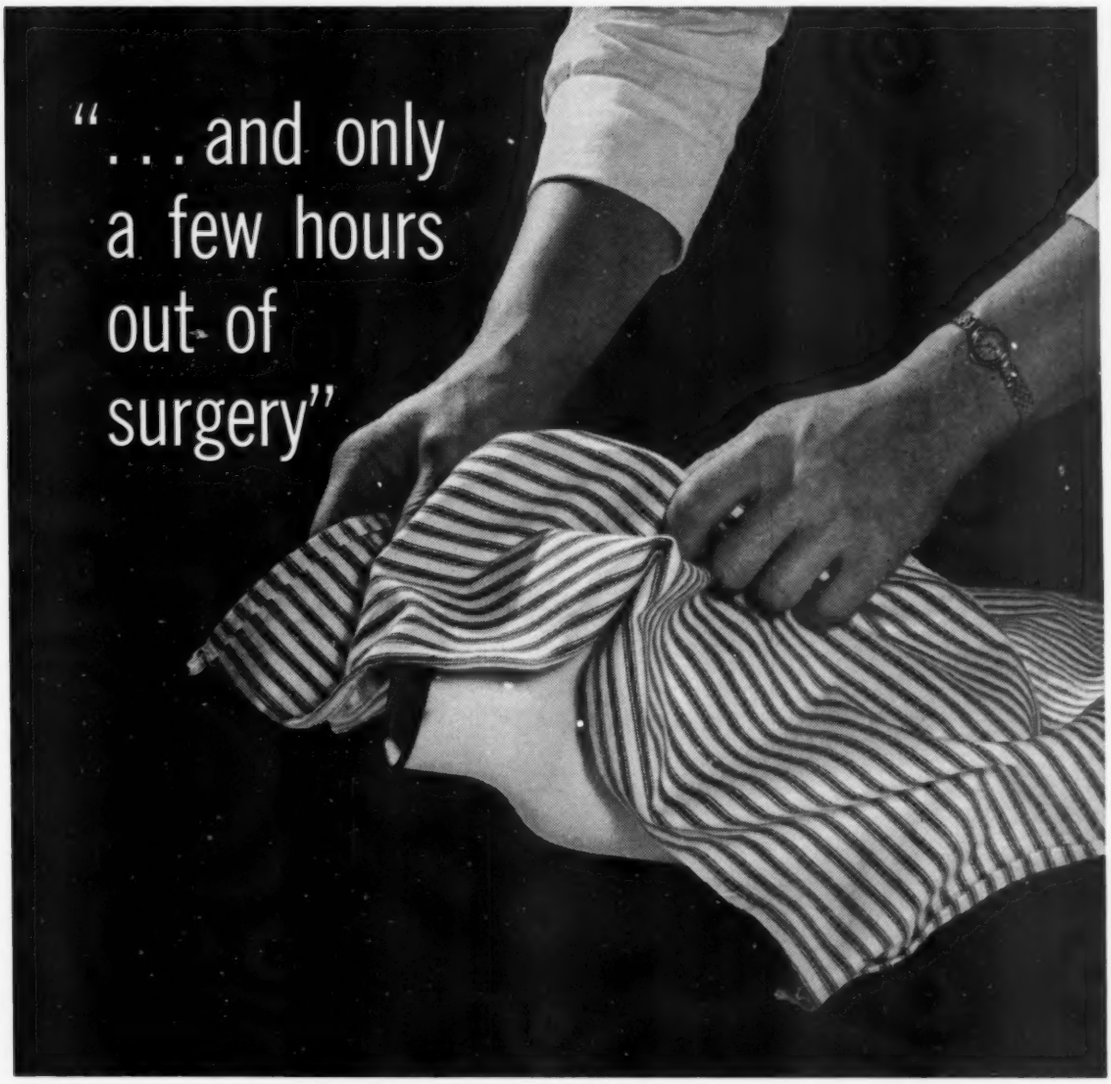

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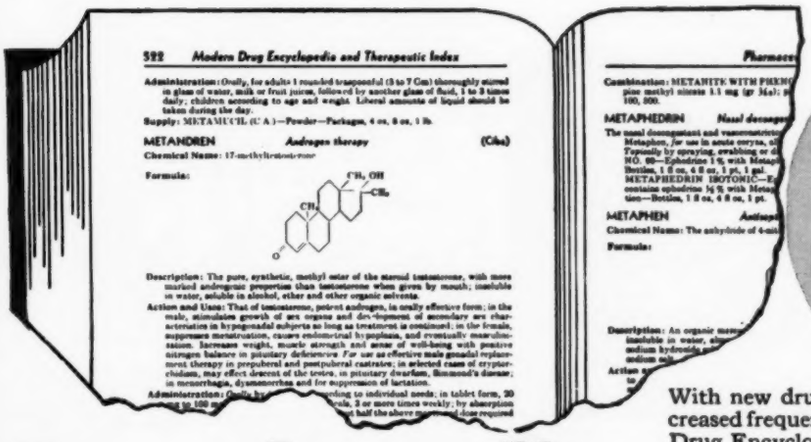
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Action and Uses: That of testosterone, potent androgen, in orally effective form; in the male, stimulates growth of sex organs and development of secondary sex characteristics in hypogonadal subjects so long as treatment is continued; in the female, suppresses menstruation, causes endometrial hyperplasia, and eventually masculinization. Increases weight, muscle strength and sense of well-being with positive nitrogen balance in pituitary deficiencies. For use as effective male gonadal replacement therapy in prepuberal and postpuberal castrates; in selected cases of cryptorchidism, may effect descent of the testes, in pituitary dwarfism, Simmond's disease; in menorrhagia, dysmenorrhea and for suppression of lactation.
Pharmacy
Combination: METAHYE WITH PHENYLEPHRINE methyl nitrate 1.1 mg (gr 1/6); 100, 500.
METAPHEDRIN Nasal decongestant
The nasal decongestant and vasoconstrictor Metaphen, for use in acute coryza, ... Topically by spraying, swabbing or ... NO. 00—Ephedrine 1%, with Metaphen, Bottles, 1 fl oz, 4 fl oz, 1 pt, 1 gal. METAPHEDRIN ISOTONIC—Ephedrine contains ephedrine ½% with Metaphen—Bottles, 1 fl oz, 4 fl oz, 1 pt.
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Formula:
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Action and Uses: ... to individual needs; in tablet form, 20 ... to 100 mg ... weekly, 2 or more times weekly; by absorption ... half the above ... dose required

Encyclopedia

INDEX

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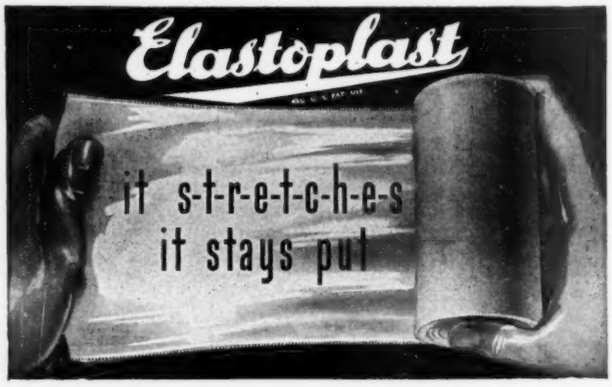

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1. Ansbro, F. P., and others: Anesthesiology *13*:306, 1952. 2. Jason, A. H., and Shaftel, H. E.: Postoperative Pain Control, presented before the Section on Anesthesiology of the American Medical Association, Chicago, Ill., June 10, 1952. 3. Deaton, W. R., Jr., and Bradshaw, H. H.: Am. Surgeon *18*:616, 1952. 4. Puderbach, W. J., and others: Journal Lancet *72*:203, 1952. 5. Tucker, C. C.: J. Kansas M. Soc. *53*:230, 1952. 6. Gross, J. M., and others: New York State J. Med. *52*:1413 (June 1) 1952. 7 Penn, S. E.: Arch. Otolaryng. *56*:59, 1952. 8. Cappe, B. E., and Pallin, I. M.: Am Pract & Digest Treat. *3*:739, 1952.

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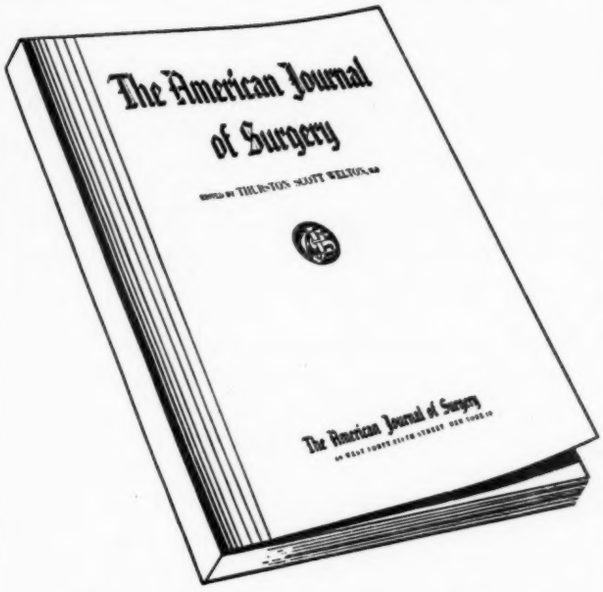

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Installations of the color television system to date have been widely acclaimed by surgeons, hospital authorities and medical students as one of the most significant advances in medical education in recent years. The equipment already has been installed at the University of Chicago, the University of Kansas, and the University of Pennsylvania, and an installation is in operation in Europe.

In the installations the color television camera is mounted in the center of a cluster of four special operating room lights, suspended over the operating table and focused directly on the operating field. Thus the camera "sees" everything that the surgeon does and has a full and unobstructed view of the whole operation.

The scene which the camera picks up is carried over special circuits to teaching rooms and doctors' offices in other parts of the hospital, where physicians and students watch the operation in full color on receivers. In that way scores, or even hundreds of students, can watch the surgeon's every move as if each of them were standing at the surgeon's elbow. Medical educators have said that this system will eliminate the old operating room amphitheater, where students are at a considerable distance from the operating table, and where their view is almost invariably obstructed by members of the operating team, or by a piece of operating room equipment.

AN impressive program of symposia, panel discussions, clinical conferences and medical motion pictures on practical surgical problems will open the 1953 season of Sectional Meetings of the American College of Surgeons at The Netherlands Plaza Hotel in Cincinnati, Ohio, January 19–21. This meeting is the first of eight scheduled for various parts of North and South America during the coming year. Surgeons from Illinois, Indiana, Kentucky, Michigan, Ohio, Ontario, West Virginia and Wisconsin are expected to attend, although there is no restriction on attendance from outside the area. Dr. M. M. Zinninger, of Cincinnati, chairman of the Committee on Local Arrangements and Professor of Surgery, University of Cincinnati College of Medicine, will preside at the opening meeting Monday morning, January 19, at 10:00 A.M.

THE American Diabetes Association offers a $250.00 prize to medical students and interns for a paper on any subject relating to diabetes. The paper can be a report of original studies, a biographical or historical note, a case report with suitable comment, or a review of the literature.

Manuscripts must be submitted on or before April 1, 1953, to the Editorial Offices of Diabetes, The Journal of the American Diabetes Association, 11 West 42nd Street, New York 36, N. Y. The papers will be reviewed by the Editorial Board which will take into consideration the value of the material and method of presentation in selecting the best paper.

THE Institute of Industrial Health of the University of Cincinnati will accept applications for a limited number of Fellowships offered to qualified candidates who wish to pursue a graduate course of instruction in preparation for the practice of Industrial Medicine. Any registered physician, who is a graduate of a class A medical school and who has completed satisfactorily at least two years of training in a hospital accredited by the American Medical Association may apply for a Fellowship in the Institute of Industrial Health. (Service in the Armed Forces or private practice may be substituted for one year of training.)

The course of instruction consists of a two-year period of intensive training in Industrial Medicine, followed by one year of practical experience under adequate supervision in industry. Candidates who complete the course of study satisfactorily will be awarded the degree of Doctor of Industrial Medicine. During the first two years the stipends for the Fellowship vary, in accordance with the marital status of the individual, from $2,100 to $3,000. In the third year the candidate will be com-

(continued on page 46)

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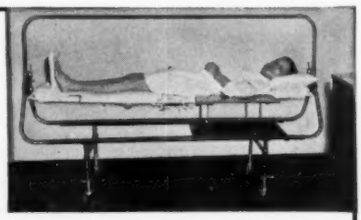

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(*continued from page 44*)

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A YALE UNIVERSITY scientist warned against the indiscriminate use of gamma globulin which is being intensively investigated for its possible effect on polio immunity. "From available information," said Dr. Joseph Melnick, Associate Professor of Microbiology in the Yale School of Medicine, "a physician using gamma globulin today may be doing a disservice to his patients. It is important that our young children develop immunity to polio while growing up, for infection in older children and adults usually has even more serious consequences."

Dr. Melnick, speaking on the "Yale Interprets the News" program over WTIC, Hartford, said, however, that the possibility of a vaccine against polio has received an impetus from new laboratory findings. He cited field trials in Houston, Texas, where large numbers of children were inoculated with gamma globulin, a human blood fraction obtained from plasma and rich in antibodies to all three polio viruses. "In the laboratory," he said, "gamma globulin has been shown to protect monkeys if injected prior to the exposure of the animals to virus, but not if given after the virus had begun to multiply within the body. Because in an epidemic people are infected at different times, it was believed that injections of gamma globulin to thousands of children would be able to reach some early enough to furnish them with a temporary supply of polio antibodies, and in this way keep the virus from infecting the spinal cord. "If it works, it will supply valuable information on the amounts of antibody necessary to abort an infection."

(*continued on page 48*)

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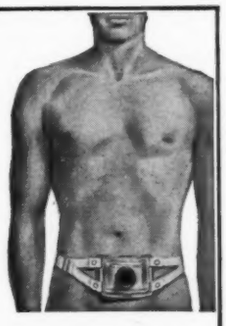

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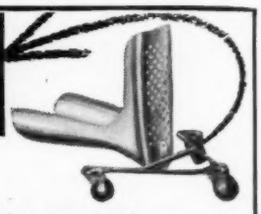

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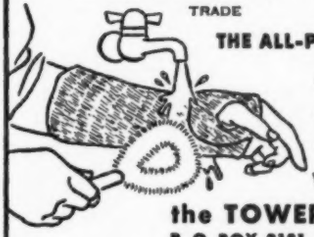

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Outside the Ivory Tower

(*continued from page 46*)

"However," Dr. Melnick said, "gamma globulin immunity lasts only a few weeks. It is not intended to be a practical preventive for polio. To be effective in warding off infection at all times, children would require several inoculations each year, and then when inoculations stopped, they might be left fully susceptible." Dr. Melnick stressed the hopeful status of polio research at present but foresaw from present reporting of cases a higher incidence of the disease in the United States this year than for the last four years.

THE first pictures of a cardiac operation performed by "deep freezing" and using a kitchen-type freezer installed in an operating room were shown at the Thirty-Eighth Clinical Congress of the American College of Surgeons by Davis & Geck, Inc., a unit of American Cyanamid Company and a Brooklyn firm specializing in the manufacture of surgical sutures and allied products. The delicate heart operation was first performed on a human by Dr. Charles B. Bailey at the Hahnemann Hospital in Philadelphia on August 29th. Dr. Bailey's second operation was performed September 19th on eleven year old Judith Schmidt of Cleveland.

In narrating the Davis & Geck pictures, Dr. Bailey told the surgeons gathered at the Waldorf Astoria that the movies were of an experimental operation, although the same procedures were used in both of the operations on humans he performed. In both operations a standard commercial deep-freeze unit was used to reduce the body temperature to 78°F. The patients were administered an anesthetic and placed in the deep freeze unit for about nine hours prior to the actual operation.

Dr. Bailey is the same surgeon who first proposed and later developed the closed technic for correcting mitral stenosis and aortic stenosis by use of the finger with a small cutting blade attached inserted into the heart. Although this was an important advance in cardiac surgery, it had limitations since it depended entirely upon the sense of touch. The deep-freeze method cuts off the flow of blood and allows the surgeon to open the heart and work by direct vision. Dr. Bailey predicts this type of operation to be "the cardiac surgery of the future."

WANT your son to be a doctor? If so, perhaps you had better move to Utah, North Dakota, Vermont or Nebraska. In an article in the September, 1952, issue of The Journal of Medical Education, Dr. Harold A. Davenport, assistant dean and chairman of the committee on admissions at Northwestern University Medical School, reports that young men and women living in the four states listed above are more likely to obtain admission to medical schools. The highest proportion of placements for the class entering in the academic year 1951–1952 was of applicants from Utah, with a ratio of 9.9 placements per 100,000 population. Nevada was lowest with a 1.9 placement. In general, the number of applicants accepted is low for states without medical schools and higher where there is a state-supported school.

Interest in medicine as a career, Dr. Davenport says, is highest among persons living in New York, Utah, New Jersey, Connecticut or Nebraska, states having the largest number of applicants. On the other hand, those from New Mexico, Missouri, Wyoming and Maine are least likely to be interested in medicine. Dr. Davenport's information was obtained from the 1950 census and from an applicant study by John M. Stalnaker, director of studies of the Association of American Medical Colleges.

HOW many doctors does it take to make a doctor? That is a question with as many different answers as there are medical schools. Staffing patterns in the seventy-two four-year medical schools of the United States were found to vary widely in a recent survey conducted by the Armed Forces Advisory Committee and the Association of American Medical Colleges. The survey was designed to determine the basic needs of the schools in the event of stepped-up mobilization of doctors.

A report on staffing patterns of medical schools in the September, 1952, issue of the Journal of Medical Education reveals that, in the event of an emergency, the needs of each school would have to be analyzed separately. The "average" medical school was staffed with twenty-six full time equivalent faculty members per 100 students in February, 1951, the time of the survey. Variation between schools

(*continued on page 50*)

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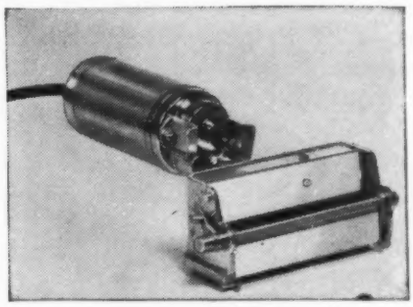

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Outside the Ivory Tower

(*continued from page 48*)

was striking, the most heavily staffed school reporting sixty-two staff members per 100 students, the lowest school only ten per 100. This variation is accounted for by the difference in basic objectives of the schools and the different circumstances and budgets under which they operate. Some schools, for example, concentrate on training general practitioners while others give more time and attention to the conduct of research and to the advanced training of specialists, medical educators and research workers.

THE National Foundation for Infantile Paralysis announces the availability of a limited number of postdoctoral fellowships in the field of public health and preventive medicine. The purpose of these National Foundation fellowships is to prepare physicians to fill the many vacancies existing in public health and preventive medicine, with priority to those who are interested in entering the teaching field.

The fellowships are for one or more years at an approved school of public health, with a period of field experience when arranged by the school. Stipends to Fellows are based on the individual need of each applicant. Fellowships may cover tuition, maintenance and an allowance for books, if required. An appropriation of $330,600 in March of Dimes funds has been made to cover the cost of the program.

Eligibility requirements include United States citizenship, sound health, graduation from an approved school of medicine, and completion of at least a one-year internship in an approved hospital. Selection of candidates will be made on a competitive basis by a Clinical Fellowship Committee composed of leaders in the field of medicine and professional education. Complete information concerning qualifications and applications may be obtained from the Division of Professional Education, the National Foundation for Infantile Paralysis, 120 Broadway, New York 5, N. Y.

THE American Board of Obstetrics and Gynecology will hold the next scheduled examinations (Part II), oral and pathological, for all candidates at the Edgewater Beach Hotel, Chicago, Illinois, May 17 through May 24, 1953. Formal notice of the exact time of each candidate's examination will be sent him several weeks in advance of the examination dates. Requests for reexamination in Part II must be made prior to February 1, 1953, submitting data regarding additional training or experience and medical school or hospital staff appointments acquired in the interim.

Inquiries relative to residency training should hereafter be directed to Lawrence M. Randall, M.D., Assistant Secretary, American Board of Obstetrics and Gynecology, Mayo Clinic, Rochester, Minnesota, who is in charge of residency training for the Board.

Application forms for Appraisal of Incomplete Training, for Certification, and requests for current Bulletins should be made to Robert L. Faulkner, M.D., Secretary, American Board of Obstetrics and Gynecology, 2105 Adelbert Road, Cleveland 6, Ohio.

ARNAR-STONE LABORATORIES, INC., is the new name for the company formerly known as Americaine, Inc. Change of name became necessary as a number of new preparations were added to the popular Americaine Topical Anesthetic ointments and solution. The same management continues, and is headed by E. A. Twerdahl, Jr. and Robert Parcell. The company is located at 1316 Sherman Avenue, Evanston, Ill.

TWO drug officials predicted that geriatric products aimed at preventing and controlling the chronic diseases of old age will gradually replace antibiotics as the foremost sales item for the nation's pharmaceutical industry. Arthur F. Gormley, vice president in charge of sales and advertising, and Dr. Charles E. Dutchess, vice president and medical director of Schenley Laboratories, Inc., made the prediction to more than 100 of the company's field sales representatives and home office executives attending a national sales convention here recently. Production of penicillin and most other antibiotics has already caught up with demand, Gormley said, adding that the antibiotic market can be expected to reach "a fairly stable level early next year and remain there." With the antibiotic market stabilized, he continued, the future of the pharmaceutical industry will then center on production and sale of geriatric products—drugs that prevent or cure the degenerative diseases of later life.

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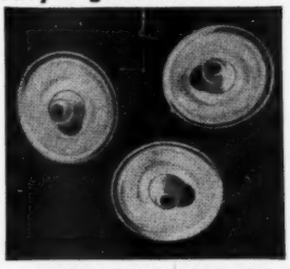

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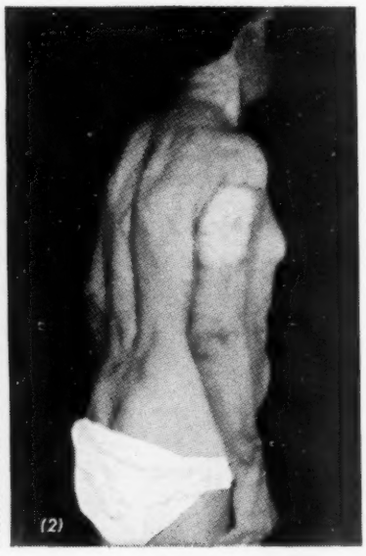

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